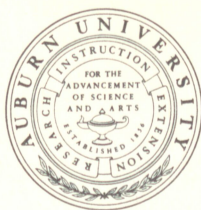


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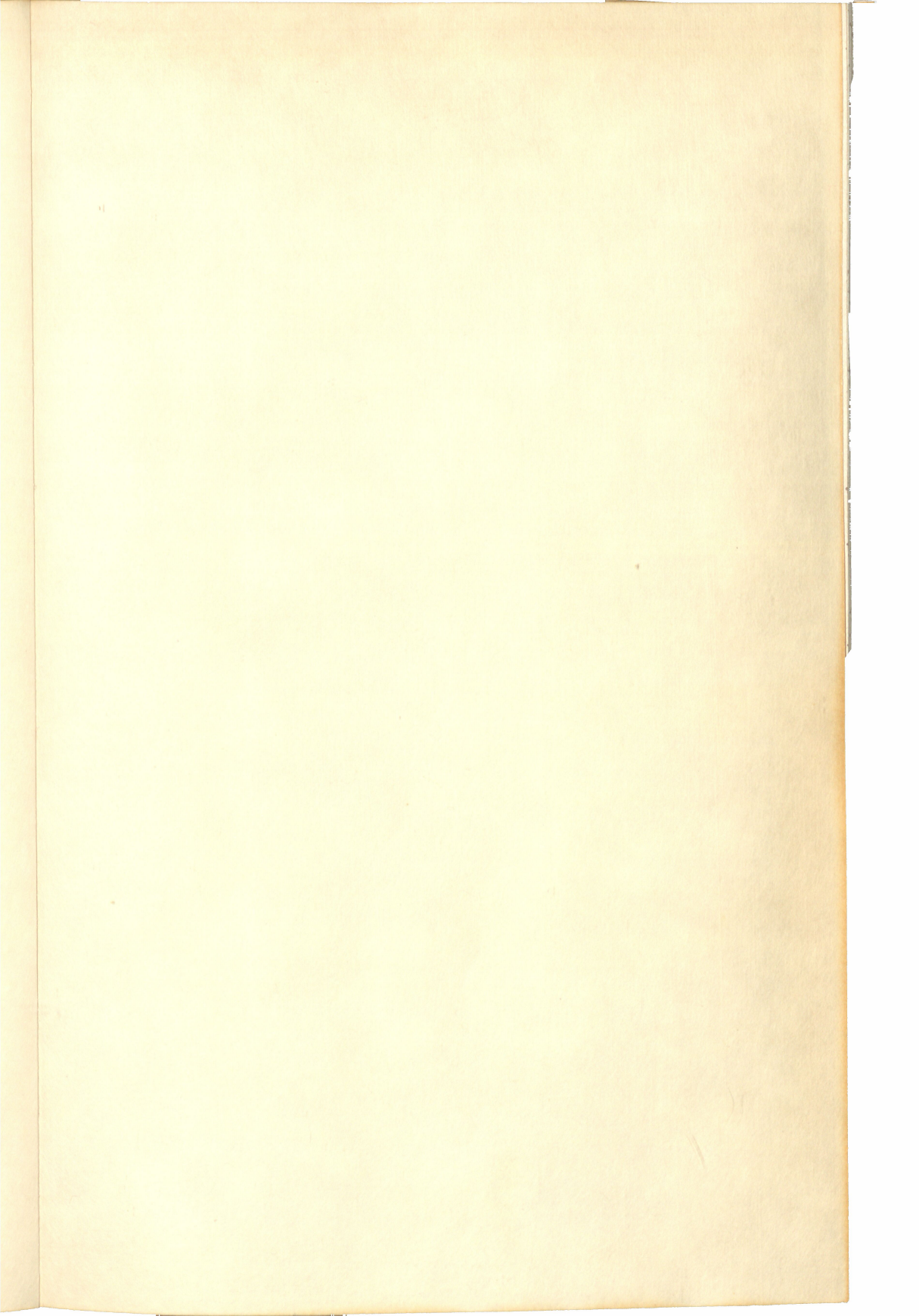


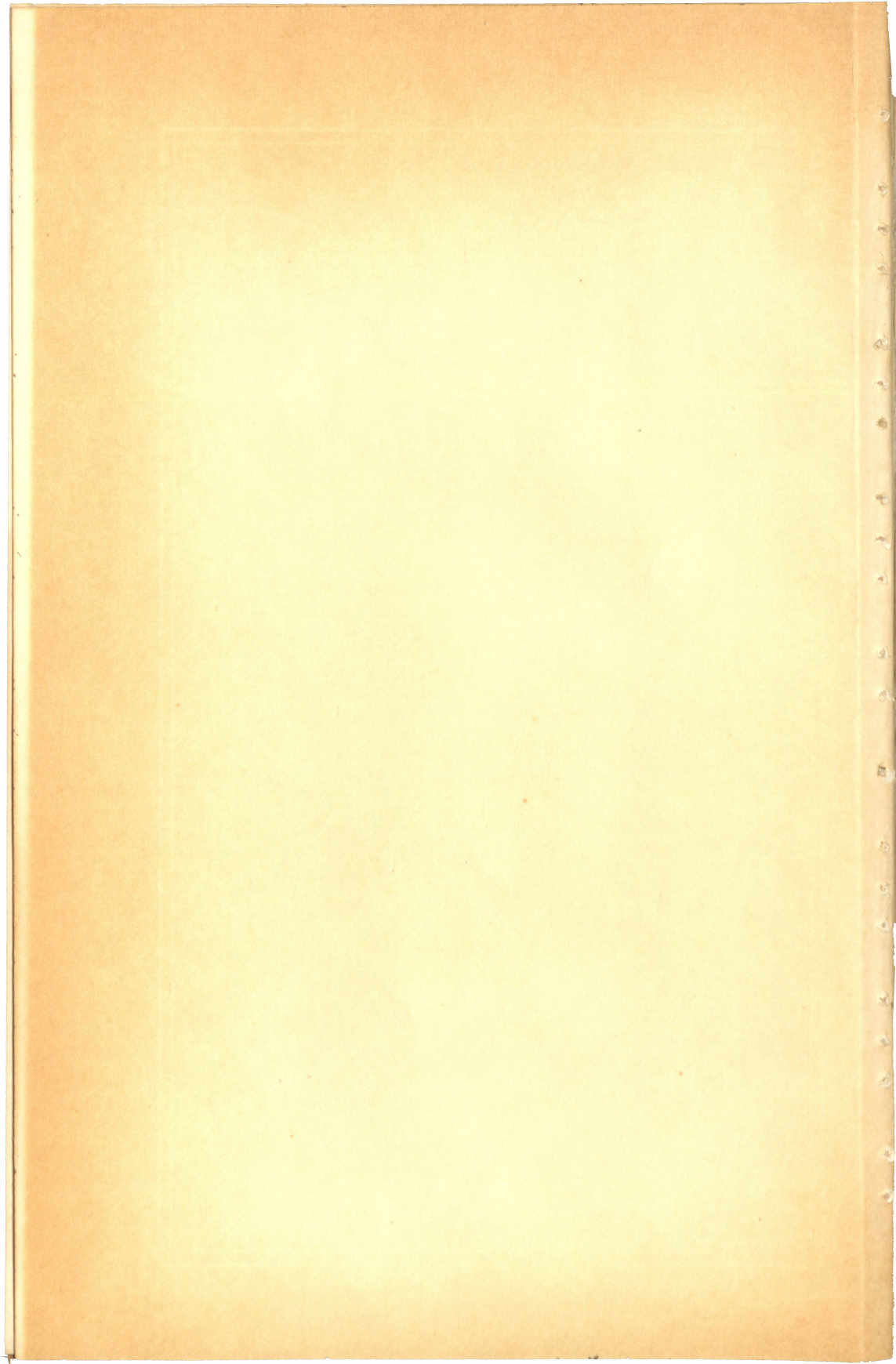
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**GEOLOGICAL SURVEY OF ALABAMA**

WALTER B. JONES, State Geologist

**BULLETIN 59**

**FLUORIDE IN THE GROUND WATER  
OF THE TERTIARY AREA  
OF ALABAMA**

By

**PHILIP E. LaMOREAUX**

Geologist, United States Geological Survey



**UNIVERSITY, ALABAMA**

1948







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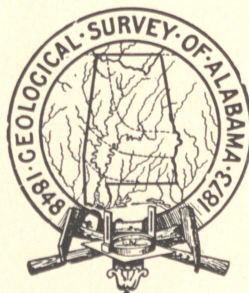
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LETTER OF TRANSMITTAL

University, Alabama

December 11, 1948

Honorable James E. Folsom  
Governor of Alabama  
Montgomery, Alabama

Sir:

I have the honor to transmit herewith the manuscript of a report entitled "Fluoride in the Ground Water of the Tertiary Area of Alabama" by Philip E. LaMoreaux, of the United States Geological Survey. It is requested that it be printed as Bulletin 59 of the Geological Survey of Alabama.

Respectfully,

WALTER B. JONES,

State Geologist.





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# FLUORIDE IN THE GROUND WATER OF THE TERTIARY AREA OF ALABAMA\*

BY  
PHILIP E. LAMOREAUX\*\*

## INTRODUCTION

In June 1940 the U. S. Geological Survey, in cooperation with the Geological Survey of Alabama under the direction of Walter B. Jones, State Geologist, began a study of the ground-water resources of the part of Alabama underlain by Cretaceous rocks. The purpose of this study was to determine the quality, quantity, occurrence, and availability of the ground water in all or parts of Autauga, Barbour, Bullock, Chilton, Crenshaw, Dallas, Elmore, Greene, Hale, Lamar, Lee, Lowndes, Macon, Marengo, Montgomery, Perry, Pickens, Pike, Russell, and Sumter Counties. The first report on these studies was "Fluoride in the ground water of the Cretaceous area of Alabama," by C. W. Carlston in 1942.<sup>1</sup>

In October 1945 the Dentistry Division, Alabama Department of Public Health, became interested in the correlation of tooth decay and mottled enamel with the chemical quality of ground water used for public supplies in the entire Coastal Plain area of the State. A cooperative arrangement between the Department of Public Health and the Ground Water Division, U. S. Geological Survey, was agreed upon for investigation of public supplies of the Tertiary area of Alabama. The present report of this phase of fluoride studies, combined with the report on the Cretaceous fluoride studies, completes the inventory of fluoride present in public water supplies in the Coastal Plain of the State.

## Purpose and Scope

This report on fluoride in ground water of the Tertiary area of Alabama includes a study of the geology and of the quality, quantity, occurrence, and availability of ground water to wells

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\*Prepared under the direction of the Department of Interior, Geological Survey, in cooperation with the Geological Survey of Alabama.

\*\*Geologist in Charge, University, Alabama.

<sup>1</sup>Carlston, C. W., Fluoride in the ground water of the Cretaceous area of Alabama: Alabama Geol. Survey Bull. 52, 1942.



and springs in all or parts of Baldwin, Barbour, Butler, Choc-taw, Clarke, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Marengo, Mobile, Monroe, Pike, Washington, and Wilcox Counties. In the tables at the end of the report are listed the data on public-supply wells and the preliminary chemical analyses of representative water samples from these wells. The analyses of these samples were made by the Quality of Water Division of the United States Geological Survey at laboratories in Washington, D. C.; Raleigh, North Carolina; and Fayetteville, Arkansas. The results of these analyses are given in the well tables at the end of the report. Field work for this report was carried on periodically through the period 1945-48.

The Dentistry Division, Alabama Department of Public Health, is now planning to make an X-ray survey at certain control points within the area. These examinations are to be conducted by hygienists who will take X-ray pictures of a representative number of school children between 8 and 15 years of age. The subjects of this examination will be chosen on the basis of findings from a questionnaire submitted to the entire student body of a locality. The study will be made not only of the dental caries and mottled enamel rate, but also of other suspected pathological effects of fluorine such as bone structure and rheumatic conditions. This study is to be tabulated and correlated with the findings of the studies of fluoride present in the ground water of the area.

### Acknowledgments

Acknowledgment is made of the cooperation of Dr. B. F. Austin, past State Health Officer, and Dr. D. G. Gill, present State Health Officer. Also, appreciation is extended for the cooperation of Dr. Polly Ayers, Dr. John E. Chrietzberg, and Dr. Boyd P. Edwards; all past members of the Division of Dental Health, Bureau of Maternal and Child Health of the State Health Department. The writer gratefully acknowledges also the assistance of Dr. Walter B. Jones, State Geologist, Geological Survey of Alabama, for cooperative help in the publication of this report; Dr. A. N. Sayre, Geologist in Charge, Division of Ground Water, and Mr. V. T. Stringfield of the U. S. Geological Survey, for general supervision and technical



aid in the preparation of this report; and to Dr. L. D. Toulmin of Birmingham-Southern College, Mr. G. R. Schoonmaker of the Ohio Oil Company, and Mr. D. H. Eargle of the U. S. Geological Survey for reviewing this paper and offering constructive criticism.

The investigation has been facilitated by the cooperation of well drillers and superintendents of public water supplies throughout the area. The information made available by these persons made possible the better interpretation and understanding of ground-water conditions of the Tertiary outcrop area of Alabama. The writer is especially indebted to Messrs. John L. Snow, M. T. Long, and drillers of the Layne-Central Company, Montgomery, Alabama; H. W. Peerson and Sons and drillers of the Peerson Drilling Company, Birmingham, Alabama; W. M. Boswell and drillers of the Deep Well Drilling Company, Foley, Alabama; M. J. Gray, Gray Artesian Well Company, Pensacola, Florida; L. M. Gray, Marianna, Florida; Howard and Edward Merry of Merry Brothers Drilling Company, Demopolis, Alabama; R. H. Reinhold, Pennsylvania Drilling Company, Demopolis, Alabama; and Walter J. Bozeman, Sardis, Alabama.

### Summary of Results of Dental Investigations

During the past 15 years increased attention has been directed to the distribution of fluorine in the water supplies of the United States. However, a knowledge of fluoride and its effect on tooth enamel and tooth decay is by no means new, for an hypothesis by Crichton-Browne<sup>2</sup> in England in 1892 speculated on the correlation of dental caries, or tooth decay, with fluorine in the diet.

Much additional work has been carried forward on studies of the relation of the amount of tooth decay and mottling of tooth enamel to the amount of fluoride in drinking water. In the United States the first thorough study of mottled enamel was made at Colorado Springs in 1916.<sup>3</sup> Since that initial work, studies have been made of dental caries and mottled enamel in

<sup>2</sup>Crichton-Browne, J. *Lancet*, vol. 2, p. 6, 1892.

<sup>3</sup>Black, G. V., and McKay, F. S., Mottled teeth, an endemic development imperfection of the teeth: *Dental Cosmos*, vol. 58, pp. 129-156, Feb. 1916.



14 counties in South Dakota.<sup>4</sup> Another investigation of the quantitative relation between the fluoride concentration of public water supplies and severity of the mottling of teeth of children between the ages of 9 and 15 has been conducted in 19 cities in Colorado, Kansas, Texas, South Carolina, Illinois, Iowa, New Mexico, Idaho, Arkansas, and South Dakota.<sup>5</sup> In 1942 an investigation was made in 13 cities in Illinois, Indiana, Ohio, and Colorado,<sup>6</sup> on the amount of dental caries and mottled enamel as related to the composition of population, climatological data, and varying fluoride concentration in water supplies continually used by children between the ages of 12 to 14. In this report the following was stated:

"Considering the relative homogeneity of these populations, the method of selecting the study groups, and the similarity of diagnostic standards used, it does not seem likely that such differences can be due to other than the mineral composition of the public water supply . . . That the inhibitory agent is the fluoride content of the water supply seems highly probable. An inspection of the range of dental caries experience associated with the use of domestic water of different fluoride concentration discloses an inverse relation in general between the amount of dental caries and the fluoride concentration of the common water supply. Relatively low dental caries experience rates are found associated with the use of domestic waters whose fluoride (F) concentrations have a range of 1 or more parts per million. Intermediately, e. g., at concentrations of 0.9 to 0.5 part per million, the influence is less marked than at the higher concentrations; nevertheless, the dental caries experience rates are distinctly lower than those associated with the use of relatively fluoride-free waters. A further inspection of the data reported . . . for those cities whose public water supplies contain less than 0.5 part per million discloses a considerable variation among those cities characterized by

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<sup>4</sup>Dean, H. T., Endemic fluorosis and its relation to dental caries, Public Health Reports, vol. 53, no. 33, pp. 1443-1452, August 1938.

<sup>5</sup>Dean, H. T., and McKay, F. S., Production of mottled enamel halted by a change in common water supply: Am. Jour. Public Health, vol. 29, no. 6, June 1939.

<sup>6</sup>Dean, H. T., Arnold, F. A., Elvove, Elias, Johnston, D. C., and Short, E. M., Domestic water and dental caries: Public Health Reports, vol. 57, no. 32, pp. 1176-1177, Aug. 1942.



high dental caries experience. This variation is marked, particularly between those communities whose public water supplies did not show fluoride (F) in excess of 0.2 part per million."

Although it is believed that limited amounts of fluoride in water supplies are an aid in the development of strong, sturdy teeth that resist decay, it is also known that excessive amounts of fluoride may have toxic effects on the bone structure of the body and may cause mottled enamel of the teeth. H. Trendley Dean, dental surgeon of the U. S. Public Health Service, has stated in regard to this:

"... chronic endemic dental fluorosis, or mottled enamel, is a water-borne disease associated with the ingestion of toxic amounts of fluorides in the water used for cooking and drinking during the period of calcification of teeth. The permanent teeth, in particular, are affected, although in areas of medium to marked severity the signs of mottled enamel are at times observable on certain of the deciduous teeth.

"The causative factor of mottled enamel is operative during the period of tooth development. Hence the affected teeth erupt, showing the characteristic markings of mottled enamel. Normally calcified teeth erupt showing a smooth, glossy, translucent structure, usually of a pale creamy white color. Teeth affected with mottled enamel, on the contrary, erupt showing a dull, chalky white appearance which in many instances later take on a characteristic brown stain, the frequency of brown stain increasing with age. In areas of marked severity, the surface of the teeth may in addition be marked by pitting. As the enamel forming organisms ... cease functioning at the time of the eruption of a tooth, mottled enamel is a permanent physical disfigurement."

Dean points out, however, that mottling of tooth enamel takes place as a result of drinking water that contains excessive quantities of fluoride during the calcification period or time of development of the permanent teeth. Only children between

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<sup>7</sup>Dean, H. T., Chronic endemic dental fluorosis: Am. Medical Assoc. Jour., vol. 107, p. 1269, Oct. 1936.



birth and 8 years of age are susceptible to this dental defect. The use of water high in fluoride is believed to have no effect upon the enamel of the teeth of adults. According to Dean, the degree of mottled enamel correlative with fluoride content is as follows:

"From the continuous use of water containing about 1 part per million, it is possible that the very mildest forms of mottled enamel may develop in about 10 per cent of the group. In waters containing 1.7 or 1.8 parts per million, the incidence may be expected to rise to 40 or 50 per cent, although the percentage distribution of severity would be largely of the 'very mild' and 'mild' types. At 2.5 parts per million an incidence of about 75 to 80 per cent might be expected, with possibly 20 to 25 per cent of all cases falling into the 'moderate' or a severer type. A scattering few may show the 'moderately severe' type. At 4 parts per million the incidence is, in general, in the neighborhood of 90 per cent, and as a rule 35 per cent or more of the children are generally classified as 'moderate' or worse. In concentrations 6 parts per million or higher an incidence of 100 per cent is not unusual."<sup>a</sup>

Many of the analyses of water from the Coastal Plain deposits of Alabama show the presence of fluoride. It is interesting to note from a bar graph prepared by the Dentistry Division of the State Department of Health, during a preliminary dental survey of the State, that the counties with the largest percentage of children having nearly perfect teeth, are counties in which the analyses of well water show appreciable amounts of fluoride. Of special interest is the fact that in Marengo County, according to this preliminary survey, approximately 46 per cent of the children examined had perfect teeth. Public water supplies at Linden, Demopolis, and Faunsdale in Marengo County contain from 1.3 to 3.2 parts per million of fluoride." In every case these towns are supplied water from wells penetrating water sands in the Eutaw formation. Similar conditions exist in Greene, Wilcox, Sumter, Lowndes, and Dallas Counties. All

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<sup>a</sup>Dean, H. T., op. cit., pp. 1278-1279.

<sup>b</sup>Carlston, C. W., Fluoride in the ground water of the Cretaceous area of Alabama: Alabama Geol. Survey Bull. 52, pp. 50-51, 1942.



these counties are known to have wells yielding water with fluoride concentrations of 1 or more parts per million.

### Outline of Geology with Reference to Water-Bearing Properties

The earlier report on "Fluoride in the Ground Water of the Cretaceous Area of Alabama"<sup>10</sup> gave data on fluoride in water from deposits of Upper Cretaceous age for the area in which these beds crop out but did not include information for ground water from these same formations down dip, beneath the Tertiary sediments in their outcrop area. In the northern part of the Tertiary area many water wells penetrate through Tertiary rocks to the underlying Providence, Ripley, Cusseta, and Eutaw formations of Upper Cretaceous age. Examples of this are public water wells at Linden, Thomaston, Catherine, Magnolia, Camden, Pineapple, Greenville, Chapman, Luverne, Goshen, Troy, Ariton, Ozark, Louisville, Clayton, Abbeville, and others. It is necessary, therefore, that data on fluoride for both Cretaceous and Tertiary aquifers be included so that complete information on fluoride in the ground water of the Coastal Plain will be available for the dental survey by the Public Health Department.

The principal water-bearing deposits tapped by water wells in the area of this report are divided into two groups, the Cretaceous and the Tertiary formations. Separate discussion of these beds in eastern and western Alabama is necessary because of the variation in lithology and thickness from east to west across the State. Charts 1 and 2 (pp. 14-15) list, in descending order, the Tertiary and Upper Cretaceous deposits penetrated by water wells in the Tertiary outcrop area of Alabama. These tables describe thickness, lithology, and water-bearing properties of formations in the southwestern and southeastern sections of the State. The geologic information recorded in the tables was obtained from publications by Stephenson and Monroe<sup>11</sup> and

<sup>10</sup>Carlston, C. W., *Idem*.

<sup>11</sup>Stephenson, L. W., and Monroe, W. H., *Stratigraphy of Upper Cretaceous series in Mississippi and Alabama: Am. Assoc. Petroleum Geologists Bull.*, vol. 22, no. 12, pp. 1639-1657, 1938.

Monroe, W. H., *Notes on deposits of Selma and Ripley age in Alabama: Alabama Geol. Survey Bull.* 48, 1941.



**CHART 1**  
**GEOLOGIC FORMATIONS AND THEIR WATER-BEARING CHARACTERISTICS**  
**IN SOUTHWEST ALABAMA**

| System     | Series           | Group and formation         | Thickness (feet)       | Character                                                                                                                                                                                   |                                                                                                                                                                                                                                                         |
|------------|------------------|-----------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tertiary   | Pliocene         | Citronelle formation        | 100                    | Lenticular beds of sand, gravel, and variegated clay. Permeable sand and gravel beds in basal part of formation are a source of ground water for domestic, industrial, and municipal wells. |                                                                                                                                                                                                                                                         |
|            | Miocene          | (Undifferentiated deposits) | 1000±                  | Fine to coarse white to brown sand, clayey sand, and variegated clay. Sand beds are an important source of ground water for public and industrial wells.                                    |                                                                                                                                                                                                                                                         |
|            | Oligocene        | (Undifferentiated deposits) | 200                    | Soft argillaceous limestone with tough ledges, hard crystalline limestone, and sandy, clayey marl; yields small amounts of water to domestic wells.                                         |                                                                                                                                                                                                                                                         |
|            | Eocene           | Jackson group               | (Undivided)            | 170                                                                                                                                                                                         | Consists predominantly of marine fossiliferous, calcareous clay, marl, limestone, and sand. These beds yield small quantities of ground water to domestic wells.                                                                                        |
|            |                  |                             |                        |                                                                                                                                                                                             |                                                                                                                                                                                                                                                         |
|            |                  | Claiborne group             | Lisbon formation       | 200                                                                                                                                                                                         | Fine to medium and coarse glauconitic sand, marl, clay, and shale, usually abundantly fossiliferous. Is of importance as a source of ground water. Water carries some fluoride.                                                                         |
|            |                  |                             | Tallahatta formation   | 100                                                                                                                                                                                         | Predominantly light-gray to tan siliceous claystone with some glauconitic sand lenses. Sand beds supply water to wells.                                                                                                                                 |
|            |                  |                             | Hatchetigbee formation | 150                                                                                                                                                                                         | Interlaminated and interbedded fine-grained olive sands and shale. Some of the more massive sand beds are a source of water supply.                                                                                                                     |
|            |                  | Wilcox group                | Tuscahoma sand         | 300                                                                                                                                                                                         | Olive-colored clay, irregularly bedded fine to coarse sand and interlaminated fine gray sand, clay, and shale. The upper part of the formation is relatively impermeable; more permeable sands in lower part of formation are a source of water supply. |
|            |                  |                             | Nanafalia formation    | 150                                                                                                                                                                                         | Greenish-gray to gray fossiliferous coarse glauconitic sand, sandstone, marl, and clay. Sand beds very permeable, excellent aquifer. Yields large supplies.                                                                                             |
|            | Paleocene        | Midway group                | Naheola formation      | 150                                                                                                                                                                                         | Interbedded gray sandy clay and fine gray sand. Upper 50 feet fine to medium glauconitic sands; upper portion of formation permeable, a source of water supply.                                                                                         |
|            |                  |                             | Porter's Creek clay    | 350                                                                                                                                                                                         | Dark-gray unfossiliferous blocky clay. Not a source of ground water.                                                                                                                                                                                    |
| Cretaceous | Upper Cretaceous | Selma group                 | Prairie Bluff chalk    | 50                                                                                                                                                                                          | Gray-white hard brittle chalk. Not a source of ground water.                                                                                                                                                                                            |
|            |                  |                             | Ripley formation       | 100                                                                                                                                                                                         | Light-gray calcareous, micaceous sand, sandstone, and chalk. Permeable sands in formation are source of ground water for domestic, industrial, and municipal supplies. Water carries fluoride.                                                          |
|            |                  |                             | Demopolis chalk        | 450                                                                                                                                                                                         | Gray compact marly chalk and nearly pure limestone; relatively impermeable, not a source of ground water.                                                                                                                                               |
|            |                  |                             | Mooreville chalk       | 350                                                                                                                                                                                         | Gray compact fairly uniform marly chalk with thin calcareous ledges; relatively impermeable, usually not a source of ground water.                                                                                                                      |
|            |                  |                             | Eutaw formation        | 400                                                                                                                                                                                         | Glauconitic sand, laminated sand and clay, and massive gray clay. Permeable sands in formation are good aquifers. Water carries fluoride.                                                                                                               |



CHART 2

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING CHARACTERISTICS  
IN SOUTHEAST ALABAMA

| System       | Series              | Group and formation | Thickness (feet)       | Character                                                                                                                                                                                               |                                                                                                                                                                                      |                                                                                                                                                                                                                       |
|--------------|---------------------|---------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tertiary     | Oligocene & Miocene | Residuum            | 100±                   | A jumbled series of highly weathered limestone, sand, and sandy clay of upper Eocene, Oligocene, and Miocene age; relatively impermeable, supplies small amounts of water to wells in its outcrop area. |                                                                                                                                                                                      |                                                                                                                                                                                                                       |
|              | Eocene              | Jackson group       | Ocala limestone        | 100                                                                                                                                                                                                     | Light-gray to buff sandy limestone; yields water to wells penetrating solution channels in the formation.                                                                            |                                                                                                                                                                                                                       |
|              |                     | Claiborne group     | Lisbon formation       | 150                                                                                                                                                                                                     | Glaucinitic sand, clay and fossiliferous marl. Sand beds are excellent water bearers and a source of supply for domestic, industrial, and municipal wells.                           |                                                                                                                                                                                                                       |
|              |                     |                     | Tallahatta formation   | 80                                                                                                                                                                                                      | Glaucinitic sand and light-gray siliceous claystone. Sand beds yield moderate supplies of ground water.                                                                              |                                                                                                                                                                                                                       |
|              |                     | Wilcox group        | Hatchetigbee formation | 25                                                                                                                                                                                                      | Glaucinitic sand and light-gray siliceous claystone. Sand beds yield moderate supplies of ground water.                                                                              |                                                                                                                                                                                                                       |
|              |                     |                     | Tuscahoma sand         | 100                                                                                                                                                                                                     | Olive to light-gray irregularly bedded fine to medium sand interbedded with fine gray sandy clay and shale; relatively impermeable except for more permeable sand beds.              |                                                                                                                                                                                                                       |
|              |                     |                     | Nanafalia formation    | 85                                                                                                                                                                                                      | Fossiliferous glauconitic sand, dark clay, claystone, and marl. Glaucinitic sands of the formation are excellent water bearers.                                                      |                                                                                                                                                                                                                       |
|              |                     | Paleocene           | Midway group           | Clayton formation                                                                                                                                                                                       | 135                                                                                                                                                                                  | Smooth-textured light gray argillaceous limestone; may supply water from solution cavities and from a channel sand at the base of the formation.                                                                      |
|              |                     | Cretaceous          | Upper Cretaceous       | Selma group                                                                                                                                                                                             | Providence sand                                                                                                                                                                      | 250                                                                                                                                                                                                                   |
|              | Ripley formation    |                     |                        |                                                                                                                                                                                                         | 250                                                                                                                                                                                  | Fine to medium marine glauconitic, in places calcareous, sand and crossbedded coarse sand and gravel. Sandy beds of the formation are sources of moderate water supplies for domestic, industrial, and municipal use. |
| Cusseta sand | 150                 |                     |                        |                                                                                                                                                                                                         | Compact calcareous sandstone, chalky fine sand, and medium and coarse sand with gravel in the basal 50 feet of the formation. Permeable sand beds are a good source of water supply. |                                                                                                                                                                                                                       |



F. S. MacNeil,<sup>12</sup> and from the present writer's field observations in the area of the report and studies of well samples and logs of water wells.

The Upper Cretaceous formations of Alabama crop out in the northern part of the Coastal Plain province in a belt 40 to 50 miles wide. As can be seen on the geologic map, the Cretaceous beds crop out in a large crescentic pattern, extending eastward across the middle of the State and swinging northwestward into Mississippi. These formations dip south beneath the Tertiary formations at low angles—about 35 feet per mile, except locally where structural disturbances have caused abnormal dips.

The principal water-bearing beds of the Upper Cretaceous deposits that lie at sufficiently shallow depths along the northern part of the Tertiary area to permit penetration by wells for a potable water supply are the Eutaw and Ripley formations of western Alabama and the Eutaw, Cusseta, Ripley, and Providence formations of eastern Alabama.

The Tertiary formations crop out in the southern two-thirds of the Coastal Plain province in Alabama. These beds lie unconformably on Upper Cretaceous deposits, and have an approximate regional dip to the south and southwest of 25 feet per mile. Nearly every Tertiary formation has a sandy or limy facies or a basal channel sand that is a potential source of ground water. A number of the wells listed in this report provide data for the description of these various water-bearing beds. Those of major importance for the development of large municipal or industrial water supplies are sands in the Nanafalia, basal Tuscalooma, and Lisbon formations of Eocene age, the solution-channeled Ocala limestone, also of Eocene age, and the sands in the Miocene beds and the Citronelle formation of Pliocene age.

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<sup>12</sup>MacNeil, F. S., Geologic map of the Tertiary formations in Alabama: U. S. Geol. Survey Oil and Gas Investigations Preliminary Map 45, 1946.

MacNeil, F. S., Summary of the Midway and Wilcox stratigraphy of Alabama and Mississippi: U. S. Geol. Survey Strategic Minerals Investigations Preliminary Rept. 3-195, 1946.

MacNeil, F. S., Correlation chart for the outcropping Tertiary formations of the eastern Gulf region: U. S. Geol. Survey, Oil and Gas Investigations Preliminary Chart 29, 1947.



### Southwest Alabama

In southern Sumter, Marengo, and Wilcox Counties, the oldest Coastal Plain formations penetrated by wells for water supplies are the Eutaw and Ripley formations. Underlying the Eutaw is approximately 1,000 feet of bedded varicolored clay, sand, and gravel of the Tuscaloosa group of Upper Cretaceous age. Some of the more permeable beds of the Tuscaloosa yield large quantities of water farther north, in and near their outcrop area, but in the area of this report the water from these deposits is too highly mineralized for ordinary uses.

The Eutaw formation, which overlies the Tuscaloosa unconformably, consists of 350 to 400 feet of glauconitic sand, laminated sand and clay, and massive gray clay. Below the Eutaw in the outcrop area is the McShan formation which is not differentiated in the area covered by this report, where the Eutaw is buried.<sup>13</sup> In the upper part of the Eutaw formation is the Tombigbee sand member, which consists of 50 to 100 feet of massive glauconitic fine- to medium-grained sand, locally containing a few indurated calcareous sandstone ledges. Below the Tombigbee sand member is 50 to 100 feet of gray carbonaceous shale and interbedded fine glauconitic sand which is underlain by at least 20 feet of coarse fossiliferous sand with phosphate nodules. In the subsurface it is difficult to distinguish the McShan and Eutaw formations, although it is suggested that the coarse sand with phosphate nodules be considered the base of the Eutaw, and that the beds below consisting predominantly of alternating fine sand and shale be included in the McShan.<sup>14</sup> The total thickness of the Eutaw and McShan formations together is estimated to be from 350 to 400 feet. The shale throughout these beds is carbonaceous and contains pyrite and massive siderite. Water from wells penetrating the Tombigbee sand member and underlying sands in the Eutaw are used for public supplies at Linden, Thomaston, and Catherine, Alabama. The water from these wells is rather high in dissolved solids, containing fairly large amounts of bicarbonate, chloride, and fluoride, but because of base exchange the water in the down-dip sands of the Eutaw and Ripley formations is relatively soft.

<sup>13</sup>Monroe, W. H., Conant, L. C., and Eargle, D. H., Pre-Selma Upper Cretaceous stratigraphy of western Alabama: *Am. Assoc. Petroleum Geologists Bull.*, vol. 30, no. 2, pp. 204-207, Feb. 1946.

<sup>14</sup>Monroe, W. H., Conant, L. C., and Eargle, D. H., *op. cit.*, p. 212.



The water of highest fluoride content recorded for wells in the Tertiary area, up to 3.4 parts per million, was from the Eutaw and Ripley formations in Wilcox and Marengo Counties. To the west of the Tombigbee River in southern Sumter County several test wells have penetrated sands of the Eutaw formation, but in every case the water was too high in chloride for domestic use.

The Selma group in southwestern Alabama is made up of the Mooreville chalk including the thin Arcola limestone member, the Demopolis chalk, the Ripley formation, and a thin tongue of the Prairie Bluff chalk at the top. The Mooreville chalk consists of about 350 feet of gray compact, fairly uniform marly chalk with a thin calcareous sandstone at its base and the Arcola limestone member at its top. Directly overlying the Mooreville is the Demopolis chalk, which consists of approximately 450 feet of compact marly chalk and nearly pure limestone with thin indurated layers throughout. The total normal thickness of the Demopolis and Mooreville chinks together in the shallow subsurface in the area described by this report is about 800 to 900 feet. The Demopolis and Mooreville chinks are relatively impermeable and yield little or no water to wells in the area. A well started in the outcrop area of either of these formations must be drilled to the underlying Eutaw formation for water. The Ripley formation overlies the Demopolis chalk and in western Alabama consists of 50 to 100 feet of light-gray calcareous, micaceous sand, sandstone, and chalk. The sand of the Ripley formation is for the most part fine- to medium-grained, micaceous, and massive, with sand beds up to 25 feet in thickness in its outcrop area. The sands of the Ripley formation appear to become increasingly chalky down the dip. The Prairie Bluff chalk overlies the Ripley formation and is the uppermost bed of the Upper Cretaceous series. In western Alabama it is a relatively thin layer, 50 to 80 feet thick, of hard brittle chalk and sandy chalk with phosphate nodules in its basal beds.

Of the entire Selma group in southwest Alabama, the Ripley formation is the only water-bearing unit. Water wells penetrating this formation usually have limited capacities and generally their yield does not exceed 50 gallons a minute. Water from the Ripley formation is high in bicarbonate, generally 300 parts per million or more, but low in total hardness. Chloride is



present in moderate amounts, up to about 50 parts per million, and fluoride up to 3.4 parts per million.

The Tertiary formations in southwestern Alabama lie unconformably on the Upper Cretaceous rocks, and have a regional dip to the south or southwest of 25 feet per mile. The oldest Tertiary formation in southwestern Alabama is the Porters Creek clay. It consists of about 350 feet of dark-gray non-fossiliferous to sparsely fossiliferous blocky clay. At the base of the Porters Creek, thin westward-extending tongues of more calcareous, fossiliferous material of the Clayton formation crop out in Sumter County and are present down dip in the subsurface. In southwestern Alabama these beds are relatively impermeable and yield little or no ground water.

The Naheola formation overlies the Porters Creek clay in southwestern Alabama, and consists of about 150 to 250 feet of interbedded gray sandy clay and fine gray sand. In the upper 50 feet of the Naheola formation is a series of glauconitic sands, sandy marls, and some shale and lignite. This upper bed is called the Coal Bluff marl member. The sands of the Coal Bluff marl member are a potential source of water for wells requiring limited supplies. The main or lower part of the Naheola consists of laminated fine sand and clay and yields little or no water to wells in southwestern Alabama.

The Nanafalia formation overlies with apparent unconformity the Naheola formation and consists of about 150 to 200 feet of fossiliferous sand, sandstone, marl, clay, and claystone. The sand beds in the Nanafalia are cross-bedded in many places, very glauconitic, and in some places calcareous, and some sand beds are massive, medium- to coarse-grained, and gravelly. These sand beds, especially those in the lower portion of the formation, yield large quantities of water to wells in north-central Choctaw, central Marengo, Wilcox, and Butler Counties. Water from the Nanafalia for the most part is of excellent quality, containing small amounts of mineral matter. In this area the water from the Nanafalia formation generally contains from 100 to 300 parts per million of bicarbonate, up to 20 parts per million of chloride, about 0.5 part per million of fluoride, and has a hardness of about 30 parts per million.



The Tuscahoma sand overlies the Nanafalia formation with possible unconformity, and consists at the surface of about 300 feet of olive-colored to gray irregularly bedded fine to coarse sand, in part fossiliferous and glauconitic, and with tough hard sandstone and interlaminated fine gray sand, clay, and shale. The Tuscahoma appears to thicken rapidly down dip in the shallow subsurface to 500 feet or more in total thickness. At many places at the base of the Tuscahoma there is a thin cross-bedded medium- to coarse-grained sand, as much as 80 feet thick. The upper part of the Tuscahoma is for the most part fairly impermeable, and does not yield large quantities of ground water; however, the basal sands are more permeable and yield water to wells throughout the outcrop of the formation and in the shallow subsurface to the south. Water from wells in the basal Tuscahoma sand is characterized in general by 100 to 200 parts per million of bicarbonate, up to 90 parts per million of hardness, up to 25 parts per million of sulfate, about 0.5 part per million of chloride, and up to 1 part per million of fluoride.

The uppermost formation of the Wilcox group in southwestern Alabama is the Hatchetigbee formation. In the main outcrop area the formation is nonfossiliferous above the basal Bashi marl member. The Hatchetigbee is about 150 feet thick in western Alabama, thinning eastward to less than 15 feet at the Chattahoochee River.<sup>15</sup> The formation consists of interlaminated fine- to medium-grained gray to olive sands and shales. The Bashi marl member at the base ranges in thickness from 2 to 25 feet. It is a medium- to coarse-grained fossiliferous, glauconitic sand commonly containing large rounded pillow-shaped calcareous concretions. The sand beds in the Hatchetigbee do not yield large quantities of water to wells in southwestern Alabama.

The Tallahatta formation overlies the Hatchetigbee formation and in southwest Alabama consists of claystone with some glauconitic sand and sandstone lenses and, locally, crossbedded coarse to gravelly sand at the base and near the top of the formation. A basal channel sand, the Meridian sand member,

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<sup>15</sup>MacNeil, F. S., Summary of the Midway and Wilcox stratigraphy of Alabama and Mississippi: U. S. Geol. Survey Strategic Minerals Investigations Preliminary Rept. 3-195, p. 21, 1946.



from 5 to 60 feet thick, yields water to wells in Choctaw County. At several localities near Needham, Alabama, flowing artesian wells have been developed in the Meridian sand member, the water from which is generally relatively high in bicarbonate, up to 300 parts per million; moderately soft, having a hardness of 70 parts per million; and relatively low in nitrate, fluoride, chloride, and sulfate. Artesian flows from this sand are for the most part 5 to 10 gallons a minute, although an occasional well yields up to 30 gallons a minute in natural flow.

The Lisbon formation including the Gosport sand overlies unconformably the Tallahatta, and consists of fine to medium and, in places, coarse glauconitic sand, marl, clay, and shale, usually abundantly fossiliferous, although nonfossiliferous in part. In southwestern Alabama the formation including the Gosport sand has a maximum thickness of about 200 feet. Of importance as a source of ground water are the sands near the top and bottom of the formation. These sands yield large quantities of ground water to wells throughout the southern part of the State. The Gosport sand, included at the top of the Lisbon formation,<sup>16</sup> although of little importance as a source of water in southwestern Alabama, is of importance as an aquifer supplying municipal wells in the south-central and southeastern parts of the State. Water from the Lisbon in southwestern Alabama is usually high in bicarbonate, 300 parts per million or more; relatively low in total hardness, up to 25 parts per million; and contains up to 1 part per million of fluoride.

The Jackson group in southwestern Alabama consists of about 170 feet of predominantly marine fossiliferous, calcareous clay, marl, limestone, and glauconitic sand. This group as mapped in southwestern Alabama by MacNeil<sup>17</sup> consists of the Yazoo clay including the Cocoa sand member and the Moodys Branch formation. These beds yield small quantities of ground water for domestic use, but as yet have not been developed as a source of public water supplies except in Monroe County and counties to the east where the group includes a sufficient thick-

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<sup>16</sup>MacNeil, F. S., Geologic map of the Tertiary formations in Alabama: U. S. Geol. Survey Oil and Gas Investigations Preliminary Map 45, 1946.

<sup>17</sup>Idem.



ness of the Ocala limestone, from which wells recover water from solution cavities.

The Chickasawhay limestone, Vicksburg group, and Red Bluff clay of Oligocene age overlie unconformably the Eocene Jackson group. They consist of approximately 200 feet of soft argillaceous limestone with tough ledges, hard to crystalline limestone, sandy argillaceous marl, glauconitic sand, and laminated fine sand, shale, and clay. A few domestic wells develop water supplies from solution cavities in the purer limestone beds and in the sand beds of the sequence. This unit is of little importance for the development of larger public supplies in southwestern Alabama.

The Catahoula sandstone and Paynes Hammock sand together form the Miocene deposits of southwestern and south-central Alabama.<sup>18</sup> These beds consist of fine to coarse white to brown sand, clayey sand, and dark to variegated clay. The sands and variegated clays in the Miocene are highly lenticular, and their correlation at present is impossible because of insufficient data. The sand beds of the Miocene are an important source of ground water, and yield water for public and industrial supplies at Bay Minette, Fairhope, Mount Vernon, Bayou La-Batre, Deer Park, Wagarville, Leroy, and St. Stephens. The water from wells in the Miocene sands is low in dissolved solids; in total hardness, from 6 to 170 parts per million; in nitrate, from 1 to 4 parts per million; in fluoride, up to 0.2 part per million; and in chloride, 10 parts or less per million; moderate in sulfate, up to 15 parts per million; and rather high in bicarbonate, up to 200 parts per million.

Unconformably overlying the Miocene deposits is as much as 130 feet of sand, gravel, and lenticular white to variegated clay of the Citronelle formation. For the most part throughout Washington, Escambia, Clarke, Mobile, and Baldwin Counties these beds are less than 100 feet in total thickness. The sand and gravel in the basal part of the Citronelle formation is a source of ground water and wells furnishing public supplies from this formation are located at Loxley, Daphne, Silverhill, Clear Spring, Foley, Citronelle, Theodore, and Grand Bay. Water from wells penetrating these sands is low in dissolved

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<sup>18</sup>MacNeil, F. S., *op. cit.*



solids and for the most part does not exceed 20 parts per million in total hardness, 0.2 part per million in fluoride, 10 parts per million in chloride, 10 parts per million in sulfate, and 5 parts per million in bicarbonate.

### Southeast Alabama

In southeastern Alabama the principal water-bearing beds of the Upper Cretaceous series penetrated by wells in the Tertiary outcrop area are the Cusseta sand, the Ripley formation, and Providence sand. These Upper Cretaceous beds crop out in east-west belts and dip south at the fairly uniform rate of 30 or 35 feet per mile below younger Tertiary deposits. The older and deeper-lying permeable sands of the Tuscaloosa, Eutaw, and Blufftown formations in this same area remain untested by water wells, and may or may not be potential sources of potable ground water. It is probable, however, that the ground water contained in the Tuscaloosa, Eutaw, and Blufftown formations down the dip in this area is fairly high in mineral content.

The Cusseta sand in southeastern Alabama consists of beds of compact calcareous sandstone, chalky fine sand, and medium and coarse sand with gravel in the basal 50 to 100 feet of the formation. The upper part of the formation is predominantly fine, very micaceous sand. In the Chattahoochee River area the thickness of the formation has been estimated at 250 feet, although in wells in the shallow subsurface the section allotted the formation does not greatly exceed 150 feet in total thickness. The Cusseta sand overlies unconformably the Blufftown formation and underlies conformably the Ripley formation of eastern Alabama. The Cusseta merges laterally westward into the Demopolis chalk of the Selma group. The medium and coarse sand and gravel in the basal part of the formation is a potential water-bearing bed throughout this portion of the State. The Cusseta sand is believed to be tapped, along with sand beds in the overlying Ripley formation, for public water supplies in the Tertiary area in southern Butler, Crenshaw, Pike, and Barbour Counties.<sup>19</sup> The water from wells believed to be developed

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<sup>19</sup>Descriptions of the Cusseta sand and Ripley formation are taken from: Monroe, Watson H., Notes on deposits of Selma and Ripley age in Alabama, Alabama Geol. Survey Bull. 48, 1941, although the author has not been able to differentiate these beds in the shallow subsurface for purposes of ground-water discussion in the southeastern part of the State.



in both formations generally contains from 150 to 300 parts per million of bicarbonate, 5 to 10 parts per million of sulfate, up to 10 parts per million of chloride, 0.5 part per million of fluoride, and 1 part per million of nitrate, and has a total hardness of about 50 parts per million.

The Ripley formation conformably overlies the Cusseta sand in eastern Alabama, is about 200 to 250 feet thick, and consists of fine to medium marine glauconitic sand in the upper part, and cross-bedded and pebbly coarse sand in the lower part. The Ripley thins westward in southern Bullock County to a little more than 100 feet. The more sandy beds of the formation are sources of limited water supplies. Yields from the Ripley formation alone generally do not exceed 50 gallons a minute, although municipal wells that are believed to be developed in both the Ripley formation and the Cusseta sand have yields of 300 gallons a minute or more. Water from the Ripley formation in south-central Alabama generally contains up to 300 parts per million of bicarbonate, 80 parts per million of sulfate, 100 parts per million of chloride, 3 parts per million of fluoride, and 0.4 part per million of nitrate, and has a total hardness of about 20 parts per million. Because of lack of sufficient samples of drill cuttings from water wells in southeastern Alabama it has been impossible so far to determine whether wells penetrating both the Ripley formation and the Cusseta sand are producing from one or the other or both of these formations. Their lithology is similar, and at present stratigraphic work in the area seems to indicate a possibility that the Cusseta sand may be a basal member of the Ripley formation rather than a separate formation.<sup>20</sup>

The Providence sand overlies unconformably the Ripley formation, and consists of about 250 feet of irregularly bedded micaceous sand and fine gravel interbedded with light-gray to white clay. The Providence sand merges laterally westward with the Prairie Bluff chalk of central and western Alabama. In some down-dip outcrops in the valley of the Chattahoochee River the sand and white clay of the Providence sand grade into finer clay and fossiliferous marine sand. The Providence sand is a potential source of ground-water supply for municipal

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<sup>20</sup>Eargle, D. H., U. S. Geol. Survey, University, Ala., oral communication, Mar. 19, 1948.



use throughout the northern part of the Tertiary outcrop area in eastern Alabama. These sands supply water to wells in the vicinity of Ozark, Clayton, Louisville, Brundidge, Luverne, and other towns in the area. This ground water contains from 200 to 300 parts per million of bicarbonate, up to 50 parts per million of sulfate, 80 parts per million of chloride, 0.9 part per million of fluoride, and 10 parts per million of nitrate, and total hardness as high as 120 parts per million. In general, however, the total hardness does not exceed 50 parts per million.

Unconformably overlying and cropping out in east-west belts to the south of the Cretaceous rocks are the younger deposits of Tertiary age. The Tertiary rocks dip gently to the south at the approximate rate of 25 feet per mile.

The Clayton formation is the oldest and basal Tertiary formation. It is estimated to have a thickness of 130 feet in sections along the Chattahoochee River. It consists for the most part of a smooth-textured argillaceous limestone. Westward the Clayton formation becomes more sandy and glauconitic in its upper part and intertongues with the Porters Creek clay in the basal portion of the Midway group. In the surface and shallow subsurface a medium- to coarse-grained channel sand is believed to be present at the base of the Clayton formation. These basal sands may be a potential source of water supply, although little is known concerning their extent and thickness, and a more detailed study is necessary before their water-yielding ability can be known. Ground water is available also from solution cavities at localities at which a pure limestone facies of the Clayton formation is present.

The Naheola formation, which in western Alabama is about 150 feet thick, thins gradually eastward to a few feet of thinly laminated sand and clay in western Butler County, east of which it is not present. Because of the relative thinness and fine texture of these beds they are of little value as a source of ground water in southeastern Alabama.

The Nanafalia formation rests unconformably on the Naheola formation where the Naheola is present and on the underlying Clayton formation elsewhere in southeastern Alabama. The Nanafalia formation in this area consists of about 85 feet of fossiliferous glauconitic sand, dark clay, claystone,



and marl. The glauconitic sand beds of the formation are a source of ground water all across the State. Many private, industrial, and municipal wells obtain water from these beds, examples of which are wells at Brewton, Georgiana, Brantley, Ozark, Abbeville, Headland, Dothan, and Elba. Water from the Nanafalia formation for the most part contains moderate amounts of mineral matter, ranging in general from 100 to 150 parts per million in total hardness, 200 to 250 parts per million in bicarbonate, up to 10 parts per million in sulfate, and less than 1 part per million in nitrate and in fluoride.

The Tuscaloosa and Hatchetigbee formations are not differentiated in southeastern Alabama, as the two formations have about the same lithology and the division is not necessary for the purposes of this report. In this area the two formations combined consist of 150 feet or less of olive- to light-gray irregularly bedded fine to medium sand, in part glauconitic and fossiliferous, with interbedded very fine gray sandy clay, clay, and shale and some lignite. Stratigraphically the Bashi marl member at the base of the Hatchetigbee formation may be used to distinguish the Hatchetigbee from the underlying beds of the Tuscaloosa formation. In southeastern Alabama the more massively bedded medium to coarse sand in the basal part of the Tuscaloosa formation is a source of ground water for wells. These beds are developed for town supplies at Garland, McKenzie, Dozier, Midland City, and Elba. Samples of water from the Tuscaloosa formation contain about 200 parts per million of bicarbonate, 10 to 50 parts per million of sulfate, 10 or less parts per million of chloride, and 0.5 part per million or less of fluoride, and have a total hardness of 50 parts per million or less.

The Tallahatta and Lisbon formations of the Claiborne group of southeastern Alabama are not divided in conformance with the geologic mapping of the area by MacNeil.<sup>21</sup> The typical claystone beds of the Tallahatta formation of western Alabama are represented in eastern Alabama by sandier lentils, although the total thickness of the formation remains fairly constant across the State. In eastern Alabama the total thickness of the

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<sup>21</sup>MacNeil, F. S., Geologic map of the Tertiary formations in Alabama: U. S. Geol. Survey Oil and Gas Investigations Preliminary Map 45, 1946.



Tallahatta and Lisbon formations in their surface outcrop probably does not exceed 200 feet. The Tallahatta formation is sandy and glauconitic in the upper 50 or 60 feet, and in the lower 10 to 20 feet. These sand beds are separated by about 30 feet of typical claystone. The Lisbon formation, including the Gosport sand, overlies the Tallahatta and consists of a very glauconitic, in part fossiliferous, gray sandy clay and sand. The glauconitic sands in the Tallahatta and Lisbon are excellent water bearers and are penetrated as sources of supply by wells at Andalusia, Opp, Brantley, Evergreen, Castleberry, Cottonwood, Midland City, Headland, Newville, Hartford, Geneva, and Dothan. Water from these wells contains, in general, 200 parts per million or less of bicarbonate, 10 parts per million or less of sulfate, 20 parts per million or less of chloride, 1 part per million or less of fluoride, and 5 parts per million or less of nitrate, and has a total hardness of 90 parts per million or less.

Younger deposits overlying the Claiborne group of southeastern Alabama are mapped together in the surface outcrop as "residuum."<sup>22</sup> These beds consist of undifferentiated residuum of limestone of the Jackson group, limestones of Oligocene age, some Miocene clay and sand, and probably some surficial terrace material. Because of the jumbled nature and relative impermeability and low porosity of these deposits along the northern margin of their outcrop, few or no large water wells are developed in them. In the shallow subsurface, where weathering and slumping have not jumbled the upper Eocene and Oligocene limestones, water from solution channels may be developed. Examples of the development of ground water from solution channels in the Ocala limestone are wells at Lockhart and Floral, Alabama. Water from these wells contains up to 180 parts per million of bicarbonate, 3 parts per million of sulfate, 11 parts per million of chloride, zero fluoride, and 3 parts per million of nitrate, and has a total hardness of 150 parts per million or less.

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<sup>22</sup>MacNeil, F. S., Geologic map of the Tertiary formations in Alabama: U. S. Geol. Survey Oil and Gas Investigations Preliminary Map 45, 1946.



### Occurrence of Fluoride in Water from Wells in the Tertiary Area of Alabama

Many analyses of water from wells in the Coastal Plain of Alabama show the presence of fluoride. As stated previously, the beds cropping out in the Coastal Plain of Alabama are divided on the basis of age into two major series, the Upper Cretaceous and Tertiary. Fluoride is contained in greater abundance in water from deposits of Upper Cretaceous age than from the younger overlying Tertiary formations. An earlier report on fluoride in the ground water of the Cretaceous area of Alabama by C. W. Carlston<sup>23</sup> shows the most general occurrence and greatest concentration of fluoride in ground water to be present in the Upper Cretaceous outcrop area in glauconitic sand beds in the Eutaw formation. Concentrations of 1 to 1.9 parts per million of fluoride were found in water from wells in the Eutaw formation at Dancey, Pickens County; Panola, Epes, and Livingston, Sumter County; West Greene and Boligee, Greene County; and Demopolis, Marengo County; also in water from the Blufftown sand at Pittsview, Russell County; and sand of the Ripley formation near Eufaula, Barbour County. Waters from wells in the Eutaw formation exceeding 1.9 parts per million in fluoride were found near Geiger, Eutaw, and Forkland in Greene County; near Demopolis, Faunsdale, and Linden in Marengo County; near Browns and Safford in Dallas County; and near Lowndesboro and Letohatchee in Lowndes County. The greatest recorded concentration of fluoride in ground water in the Coastal Plain, 6.8 parts per million, was recorded for the Eutaw formation in the Letohatchee area.<sup>24</sup>

The water from beds of Tertiary age in southern Alabama contains in general less than 1 part per million of fluoride. Along the northern margin of the Tertiary outcrop area many wells penetrate through the relatively thin deposits of Tertiary age and develop ground water of higher fluoride content from the underlying sands of Upper Cretaceous age. For a complete record of fluoride in ground water of the Coastal Plain it is necessary to include herein a discussion of fluoride in water from wells that reach these underlying Upper Cretaceous

<sup>23</sup>Carlston, C. W., Fluoride in the ground water of the Cretaceous area of Alabama: Alabama Geol. Survey Bull. 52, 1942.

<sup>24</sup>Carlston, C. W., op. cit., p. 44.



deposits in the Tertiary outcrop area. Of primary importance among the Upper Cretaceous aquifers in this area are the water-bearing sands of the Eutaw and Ripley formations of southwestern Alabama and the Cusseta sand, Ripley formation, and Providence sand of southeastern Alabama. The greatest fluoride content in water from these beds in the Tertiary area is found in water from wells in the Eutaw and Ripley formations, where concentrations of as much as 3.4 parts per million of fluoride were found.

The Eutaw formation is penetrated by wells in the northwestern Tertiary outcrop area at Linden, Thomaston, Camden, and Catherine in Marengo and Wilcox Counties. At Linden and Thomaston the greatest fluoride concentration found was 3.2 parts per million. Water from wells in the Eutaw formation at Catherine in Wilcox County had fluoride concentrations up to 3 parts per million. These wells drilled into the Eutaw formation in Marengo and Wilcox Counties range in depth from 1,000 to 1,350 feet. The sands of the Eutaw are predominantly glauconitic fine- to medium-grained quartz sand of moderate permeability, the yields of wells ranging from 10 or 15 gallons a minute to as much as 150 gallons a minute.

Fine glauconitic sands in the Ripley formation are penetrated by wells drilled through overlying Tertiary deposits in Marengo, Wilcox, and Butler Counties. Samples of water from these wells contained from 0 to 3.4 parts per million of fluoride. Town wells at Camden and Pineapple yield water containing 1.2 and 2.4 parts per million of fluoride, respectively. The greatest concentration of fluoride in water from the Ripley formation was recorded in an analysis of water from the C. W. Agee well at Magnolia, Alabama, in which 3.4 parts per million of fluoride was present. Water wells penetrating sands of the Ripley in the Tertiary outcrop area range in depth from 87 to 570 feet, the greatest concentration of fluoride being present in the deeper wells.

The Tertiary formations crop out in the southern half of the Coastal Plain province of Alabama. These beds lie unconformably on older Upper Cretaceous deposits and dip to the south and southwest about 25 feet per mile. As just described, a number of wells recorded in the Tertiary ground-water study are developed in the Upper Cretaceous water-bearing beds, but of



greater importance for the development of larger municipal supplies are the sands in the Nanafalia formation, the basal part of the Tusahoma sand, and the Lisbon formation, all of Eocene age, the solution-channelled Ocala limestone, also of Eocene age, and sands in the Miocene formations and in the Pliocene Citronelle formation.

Of representative samples of water from wells in the Tertiary formations of Alabama, only two contained 1 part per million of fluoride or more. One well, owned by S. L. Fleming, Gilberttown, is 220 feet deep and yields water from the Lisbon formation containing 1 part per million of fluoride. The other, a municipal well at Thomasville, 702 feet deep, yields water from the Nanafalia formation containing 1.2 parts per million of fluoride.

Water samples collected from the Tusahoma sand contained from 0 to 0.4 part per million of fluoride. In Butler County water from the town wells at Garland and McKenzie contained 0.4 part per million of fluoride. Formations of Tertiary age, including the limestones of Jackson (Eocene) and Oligocene age, the Miocene deposits, and the Citronelle formation supply water to wells throughout the southern part of the Tertiary area. Samples of water from wells at Lockhart, Monroeville, Dothan, Geneva, Citronelle, Robertsedale, Foley, and many other towns contained 0.2 part per million of fluoride or less. No sample of water collected from these younger formations contained more than 0.2 part per million of fluoride.

### Source of Fluoride in Ground Water

Because of the lack until recent years of accurate methods of determining small amounts of fluoride by rock analysis, relatively little information is available on the amount and distribution of fluoride in rocks, particularly in sedimentary rocks. Because the amount of fluoride in ground water differs from place to place, it appears that a direct relation exists between the composition of a sedimentary material and the amount of fluoride present in water from that sediment. Several theories have been advanced as to the source of the fluoride. It may be that fluoride present in sea water during the original period of deposition of a marine bed has not been completely flushed



out. In some regions fluoride may be traced directly to magmatic sources or to vapors in the atmosphere from a volcanic source. It is also possible that fluoride is furnished by weathering or solution of some of the more common fluoride-bearing minerals such as apatite, tourmaline, topaz, vesuvianite, lepidolite, phlogopite, glauconite, or others. If these fluoride-bearing minerals are the source, they would have to be affected by some erosional process that would release the fluoride in soluble form.

Fluoride has been correlated with the presence of volcanic ash and tuffaceous materials in sediments. According to Mansfield<sup>25</sup> phosphates and fluoride have an affinity for each other, and deposition of fluoride could occur in localized areas where conditions favored the accumulation of phosphates. He stated further, that conditions are favorable for the formation of enduring deposits of phosphates or fluorapatite only during times of volcanic activity when large amounts of fluoride are being supplied. As a result, he found that all major phosphate deposits in the United States may be correlated with periods of volcanic activity. Volcanic ash, generally altered to bentonite, has been commonly recognized in surface exposures and in samples from wells in the Upper Cretaceous Eutaw and Ripley formations and, rarely, near the top of the marine beds of the Tuscaloosa group and in the Cusseta and Providence sands. In the Tertiary, phosphatic material has been noted in the Nanafalia formation, upper part of the Lisbon formation, and possibly in the Miocene sediments.

Gwynne<sup>26</sup> suggests that the breaking down by weathering processes of the more insoluble fluoride minerals might be accomplished by the action of sulfuric acid formed by the decomposition of pyrite. Pyrite is widely found associated with sedimentary rocks in both the Tertiary and the Cretaceous formations of the Alabama Coastal Plain. In addition, fluoride-bearing minerals such as glauconite, tourmaline, topaz, vesuvianite, and some of the micas and phosphates are present in

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<sup>25</sup>Mansfield, G. R., The role of fluorine in phosphate deposition: *Am. Jour. Science*, vol. 238, pp. 863-879, 1940.

<sup>26</sup>Gwynne, C. S., Geological significance of fluorine in Iowa well-waters: *Pan-American Geologist*, vol. 62, pp. 139-140, 1934.



sediments of the Alabama Coastal Plain.<sup>27 28</sup> The presence of fluoride-bearing minerals and abundance of pyrite in some of the water-bearing sands of the Cretaceous and Tertiary of Alabama somewhat substantiate Van Burkalow's theory<sup>29</sup> that fluoride in soluble form should be expected where two conditions prevail, (1) an abundance of fluorine-containing minerals, and (2) an abundance of pyrite in association with concentrated organic material which would facilitate decomposition of the fluorine-bearing minerals. Following is a table listing the principal water-bearing sands and the presence of volcanic or phosphatic material, pyrite, lignite, and glauconite.<sup>30</sup> From the chart it is seen that the high fluoride content in water from the Eutaw and Ripley formations could be correlated with the presence of abundant phosphatic material, pyrite, some lignite, and abundant glauconite. In contrast, the formations that do not contain these minerals yield water low in fluoride. The chart also shows that the presence of the mineral glauconite is not alone responsible for the presence of fluoride, as the sands of the Nanafalia and Lisbon formations are very glauconitic, yet the ground water from these sands is generally low in fluoride. These formations contain traces of pyrite, lignite, and phosphatic material, but it is not known whether the fluoride content is low because the amounts of these materials are small.

It is interesting to note that the deeper wells penetrating the Ripley formation in the Tertiary outcrop area in Marengo and Wilcox Counties have greater concentrations of fluoride than the shallower up-dip wells in the same region that penetrate the same sands. This indicates the possibility that the amount of fluoride in the water may be related not only to the presence of certain minerals in deposits in this area but also to the depth to the formation and the distance to the outcrop, and therefore to the extent of ground-water circulation and the length of time

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<sup>27</sup>Petrographic studies made of outcrop and well samples by the author in connection with this project.

<sup>28</sup>Grim, Ralph E., *The Eocene sediments of Mississippi*: Miss. Geol. Survey Bull. 30, 1936.

<sup>29</sup>Van Burkalow, Anastasia, *Fluorine in United States water supplies*: Geographical Review, vol. 36, no. 2, pp. 187-188, 1946.

<sup>30</sup>Based on surface and subsurface studies by author and on oral reports by L. C. Conant, Feb. 5, 1948; D. H. Eargle, Feb. 6, 1948; and G. R. Schoonmaker, Feb. 10, 1948.



CHART 3  
CHART SHOWING POSSIBLE MINERAL CORRELATION WITH FLUORIDE IN GROUND WATER IN ALABAMA

| System Series | Group and Formation | Volcanic material, phosphate or bentonite | Pyrite                  | Lignite             | Glauconite               | Fluoride (ppm)                      |
|---------------|---------------------|-------------------------------------------|-------------------------|---------------------|--------------------------|-------------------------------------|
| Tertiary      | Pliocene            | Citronelle formation                      | None                    | None                | None                     | Generally less than 0.2.            |
|               | Miocene             | Miocene sands                             | Rare                    | Common              | None in fresh-water zone | Generally less than 0.2.            |
|               | Eocene              | Lisbon formation                          | Common                  | Varies in abundance | Abundant                 | Up to 1.0, generally less than 0.5. |
|               |                     | Tuscahoma sand                            | Some                    | Common to abundant  | Some                     | Up to 1.0, generally less than 0.5. |
|               | Oligocene           | Nanafalia formation                       | Rare                    | Common              | Abundant                 | Up to 1.0, generally less than 0.5. |
|               |                     | Providence sand                           | Common                  | Lignitic shale      | Common down dip          | Generally less than 0.5.            |
| Cretaceous    | Upper Cretaceous    | Ripley formation                          | Abundant                | Abundant            | Abundant                 | Up to 3.4, commonly over 1.0.       |
|               |                     | Cusseta sand                              | ??                      | Lignitic clay       | Rare                     | ??                                  |
|               |                     | Blufftown formation                       | Common to abundant      | Common to abundant  | Common to abundant       | Up to 1.2.                          |
|               |                     | Eutaw formation                           | Common                  | Abundant            | Abundant                 | Up to 6.8, commonly over 1.0.       |
|               | Lower Cretaceous    | McShan formation                          | Abundant                | Common              | Common                   | Not differentiated from Eutaw.      |
|               |                     | Upper nonmarine                           | Rare                    | Lignitic clay       | None                     | Generally less than 0.5.            |
|               |                     | Marine                                    | None ? (Ash near top ?) | Abundant            | Common to abundant       | Up to 1.4.                          |
|               |                     | Lower nonmarine                           | Rare                    | Rare                | None                     | Generally less than 0.5.            |



the water has been associated with that deposit. Thus an explanation of the relatively high fluoride content in the Eutaw and Ripley formations in the area of this report may be that these down-dip marine deposits of fine sands of moderate permeability have not been completely flushed of the original sea water in which they were deposited. Supporting this hypothesis is the general presence of fairly large amounts of chloride with the fluoride. It is possible also that greater pressure and temperature at greater depths catalyze the reaction.

Carlston found a direct correlation between increase in bicarbonate content and increase in fluoride content.<sup>31</sup> He believed that the increase in fluoride correlative with bicarbonate suggested that the same material which causes base exchange may be contributing fluoride to the ground water, or that possibly the relation of high fluoride to high bicarbonate may be due to the length of time that ground water is in contact with the two different materials. The increase in bicarbonate in water as it moves down the dip of a formation is caused by carbon dioxide reacting with calcium and magnesium in the water sands, subsequent formation of bicarbonates of calcium and magnesium. These bicarbonates may then react upon the base exchange silicates that give up sodium in exchange for calcium and magnesium. This slow, continuous process results in an ever increasing amount of sodium bicarbonate in the water. Carlston also pointed out that phosphate and bentonite occur in the upper part of the Eutaw formation, and that this may be significant in the identification of the agents contributing fluoride to the ground water of the Eutaw.

To reason further along lines of correlation between fluoride and soft water with high bicarbonate content, it is believed that glauconite, a complex hydrated silicate of potassium and ferric iron, is the chief base-exchange agent causing softening of water percolating down dip in the Eutaw, Ripley, Nanafalia, Lisbon, and other marine formations containing glauconitic sands. In the Coastal Plain deposits of Alabama there is a relation (see chart 3, p. 33) between fluoride-bearing ground water and

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<sup>31</sup>Carlston, C. W., Fluoride in the ground water of the Cretaceous area of Alabama: Alabama Geol. Survey Bull. 52, pp. 17-20, 1942.



marine glauconitic sands. In the Montgomery area, for example, wells penetrating nonmarine alluvium and nonmarine, non-glauconitic sands and clays of the Tuscaloosa group yield water containing no fluoride, whereas wells in the same area developed in the Eutaw formation and in the marine glauconitic sands in the middle part of the Tuscaloosa contain 1 part per million of fluoride or more. Fluoride exceeding 1 part per million is also found in the Coastal Plain in wells developed in the glauconitic marine sands of the Eutaw, Ripley, Nanafalia, and Lisbon formations. However, greater amounts of fluoride are found in water from deep wells penetrating down-dip facies of the Eutaw and Ripley formations than in waters from the shallower wells in the Nanafalia and Lisbon formations of Tertiary age. In Alabama, wells developed in the nonmarine beds of the Tuscaloosa group in the Cusseta and Providence sands, Miocene sands, Citronelle formation, and river alluvium there are no known waters with a fluoride content exceeding 1 part per million, and for the most part water from these formations contains less than 0.2 part per million of fluoride. On the other hand, in contradiction to a correlation of fluoride with glauconitic marine deposits is the general lack of fluoride in water from municipal wells penetrating glauconitic marine sands in the Nanafalia formation at Sweetwater, Georgiana, Brantley, Ariton, Ozark, Newton, Abbeville, Dothan, Columbiana, and other places; and in water from glauconitic sands in the Lisbon formation at Andalusia, Opp, Evergreen, and Dothan. However, in nearly every case, wells developed in these shallower glauconitic sands do not exceed 500 feet in depth, although a few are as much as 700 feet deep. These younger deposits and their shallower depths would indicate a shorter duration of contact of percolating ground water with the materials of the aquifer, in contrast to a longer duration of contact in the older marine sands of Upper Cretaceous age tapped by wells in the northern Tertiary outcrop.

Chemical analyses were made by E. E. Creitz of the U. S. Bureau of Mines on samples of glauconite from beds of the Eutaw and Lisbon formations. It was found that these samples of glauconite were below the limit of detection (0.5 percent) in fluoride. However, this does not eliminate the possible correlation of glauconite with fluoride, because through its base-



exchange properties glauconite may be an active reagent in the release of fluoride to ground-water supplies even though it is not the source.

Further detailed studies of lithology, especially entailing correlation of petrographic and possibly chemical analysis of constituent particles in an aquifer to determine presence of fluoride-bearing minerals and their relation to minerals such as pyrite and lignite which would cause the release of fluoride to ground water, will have to be made before final conclusions can be drawn on the source of fluoride in ground water. It may be seen from chart 3, p. 33, that in the deposits of the Alabama Coastal Plain there is a close relation between fluoride in ground water and sands which contain pyrite, lignite, phosphate, volcanic materials, and glauconite. Other influencing factors may be depth and period of contact.

### Summary

The water from the glauconitic sands in the Eutaw, Ripley, Nanafalia, and Lisbon formations of the Coastal Plain of Alabama contain larger amounts of fluoride than does that from other formations. Samples of water from wells used for public supplies in the central Coastal Plain area which contain from 1 part per million up to 6.8 parts per million should give an adequate range of fluoride concentration to contrast with the very low fluoride in well water of the southern part of the Tertiary area, and so furnish the control necessary for the study of dental fluorosis by the Alabama Department of Public Health. This planned dental survey should further the understanding of the beneficial and harmful effects experienced by children and adults using water of varying fluoride content. In addition, it will be interesting to note the relation, if any, of the warm, humid climate typical of Alabama to the amount of fluoride in ground water necessary to cause these effects. It is also possible that further pathological studies may show the effects of fluoride on the human system with regard to bone



structure, rheumatic conditions, thyroid gland abnormalities, metabolism abnormalities, and other physical disorders.

In areas where high fluoride concentrations occur it is generally possible to obtain water free from fluoride by drilling to either overlying or underlying formations. Therefore, after additional information is available on the effects of fluoride, it may be possible to use a combination of fluoride-free water with fluoride-bearing water to obtain the optimum amount of fluoride necessary for the most beneficial health.



TABLE 1  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## BALDWIN COUNTY

| Well Number | Location            | Owner or name               | Driller                | Type of Well | Depth of Well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                                |
|-------------|---------------------|-----------------------------|------------------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|--------------------------------------------------------|
| 1           | Bay Minette         | Town well No. 3             | Layne-Central          | D            | 228                  | 8                        |                       | Miocene sands                                  | Drilled in 1938.                                       |
| 2           | Bay Minette         | Town well No. 1             |                        | D            | 295                  |                          |                       | Miocene sands                                  | Drilled in 1923. Abandoned.                            |
| 3           | Bay Minette         | Town Well No. 2             |                        | D            | 234                  | 6                        |                       | Miocene sands                                  |                                                        |
| 4           | Bay Minette         | Town well No. 4             | Layne-Central          | D            |                      |                          |                       |                                                | Under construction at present.                         |
| 5           | Loxley              | Public school               |                        | Dr           | 50                   | 2                        |                       | Citronelle fm.                                 |                                                        |
| 6           | Robertsdale         | City                        | Layne-Central          | D            | 181                  | 8                        |                       | Miocene sands                                  | Drilled in 1929.                                       |
| 7           | Robertsdale         | Gulf Ice & Cold Storage Co. | Deep Well Drilling Co. |              |                      |                          |                       |                                                |                                                        |
| 8           | Daphne              | Public school               |                        | D            | 157                  | 6                        | 139                   | Miocene sands                                  | Drilled in 1946. Log.                                  |
| 9           | Daphne              | C. M. Nelson                | Deep Well Drilling Co. | D            | 90                   | 3                        |                       | Citronelle fm.                                 |                                                        |
| 10          | Daphne              | J. F. Porter                |                        | D            | 103                  | 3                        | 95                    | Citronelle fm.                                 | Drilled in 1946. Log.                                  |
| 11          | Fairhope            | City                        | Gray Artesian Co.      | D            | 214                  | 3                        |                       | Miocene sands                                  | Flowing well. Cased.                                   |
| 12          | Fairhope            | City                        | Layne-Central          | D            | 389                  | 10                       |                       | Miocene sands                                  | Drilled in 1935. Next to Bay.                          |
| 13          | Point Clear         | Public School               | A. M. Brodbeck         | D            | 40                   | 8                        | 350                   | Miocene sands                                  | Drilled in 1944. Log.                                  |
| 14          | Silver Hill         | Public School               | B. Eckmund             | D            | 60                   | 2                        |                       | Alluvium                                       |                                                        |
| 15          | Clear Spring        | Clear Spring School         |                        | D            |                      |                          | 57                    | Citronelle fm.                                 | Spring.                                                |
| 16          | Foley               | City                        | Gray Artesian          | D            | 134                  | 10                       | 134                   | Citronelle fm.                                 | Drilled in 1939.                                       |
| 17          | Foley               | City                        | Gray Artesian          | D            | 128                  | 8                        |                       | Citronelle fm.                                 | Drilled in 1935.                                       |
| 18          | Foley               | City                        | Gray Artesian          | D            | 146                  | 12                       | 146                   | Citronelle fm.                                 | Drilled in 1943.                                       |
| 19          | 5.5 mi. E. of Foley | U. S. Navy, Barin Field     | Layne-Central          | D            | 152                  | 12                       | 152                   | Miocene sands                                  | Drilled in 1943. Field has another well 129 feet deep. |
| 20          | Peterson Point      | W. F. Mandrell              | Deep Well              | D            | 152                  | 4                        |                       | Miocene sands                                  | Drilled in 1946.                                       |
| 21          | 11 mi. S. of Foley  | State of Alabama            | C. C. C.               | D            | 35                   | 2 1/4                    |                       | Alluvium                                       |                                                        |
| 22          | 11 mi. S. of Foley  | State of Alabama            | C. C. C.               | D            | 33                   | 3                        |                       |                                                | Drilled in 1942.                                       |
| 23          | Gulf Shores Hotel   | Gulf Shores Hotel           | Deep Well Drill.       | D            | 369                  | 8-6                      | 369                   | Miocene sands                                  | Drilled Dec. 30, 1946.                                 |
| 24          | Point Clear         | Grand Hotel                 | Layne-Central          | D            | 137                  | 8-4                      | 137                   | Miocene sands                                  |                                                        |
| 25          | Point Clear         | Grand Hotel                 | Layne-Central          | D            | 326                  | 12-8                     | 326                   | Miocene sands                                  | Drilled in 1940.                                       |
| 26          | Point Clear         | Grand Hotel                 | Layne-Central          | D            | 340                  | 18-10                    | 340                   | Miocene sands                                  | Drilled in 1947.                                       |
| 27          | Fort Morgan         | Fort Morgan Inn             |                        | Dr           | 33                   | 2                        | 33                    | Recent sands                                   | Drilled in 1948.                                       |

<sup>1</sup>Abbreviations: J, jetted; D, drilled; Dr, driven.

<sup>2</sup>Abbreviations: fm., formation; res., residuum; ls., limestone.



TABLE 1—Continued

Analyses by G. A. Billingsley, R. H. Dellett, Evelyn Holloman, V. T. McNamara and D. M. Parrish  
Parts per million  
BALDWIN COUNTY

| Well data   |                                            |                                      |                      |                |      |                           |                         |            |                              | Chemical analyses               |                            |               |              |                            |                |  | Remarks |
|-------------|--------------------------------------------|--------------------------------------|----------------------|----------------|------|---------------------------|-------------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|--|---------|
| Well number | Water level                                |                                      |                      | Yield (g.p.m.) |      | Use of <sup>1</sup> water | Date of collec-<br>tion | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |  |         |
|             | Elevation of ground above sea level (feet) | Above + or below—land surface (feet) | Above mean sea level | Flow           | Pump |                           |                         |            |                              |                                 |                            |               |              |                            |                |  |         |
| 1           | 255                                        | -84                                  | 171                  |                | 350  | PS                        |                         | 69         |                              |                                 |                            |               |              |                            |                |  |         |
| 2           | 255                                        |                                      |                      |                |      |                           |                         |            |                              |                                 |                            |               |              |                            |                |  |         |
| 3           | 255                                        | -90                                  | 165                  |                | 350  | PS                        | 8-21-45                 | 69         |                              | 6.0                             | 1.0                        | 4.0           | 0            | 0                          | 6              |  |         |
| 4           |                                            |                                      |                      |                |      |                           |                         |            |                              |                                 |                            |               |              |                            |                |  |         |
| 5           | 170                                        | -34                                  | 106                  |                | 10   | PS                        | 9-21-46                 | 70         |                              | 5.0                             | 1.0                        | 5.0           | 0            | 2.9                        | 9              |  |         |
| 6           | 140                                        | -20                                  | 115                  |                | 300  | PS                        | 8-17-45                 | 70.5       |                              | 4.0                             | 1.0                        | 7.0           | 0            | 1.2                        | 8              |  |         |
| 7           | 135                                        | -65                                  | 85                   |                | 250  | Ind.                      | 9-21-46                 | 70         |                              | 3.0                             | 1.0                        | 7.0           | 0            | 9.6                        | 21             |  |         |
| 8           | 150                                        | -73                                  | 70                   |                |      | PS                        |                         | 71         |                              |                                 |                            |               |              |                            |                |  |         |
| 9           | 143                                        | +40                                  |                      |                | 17   | D                         | 9-21-46                 |            |                              |                                 |                            |               |              |                            |                |  |         |
| 10          | 15                                         | -98                                  | 26                   |                | 200  | PS                        | 8-17-45                 | 71         |                              | 32.0                            | 7.0                        | 4.0           | 0            | 0.1                        | 26             |  |         |
| 11          | 124                                        | -84                                  | 37                   |                | 400  | PS                        | 8-17-45                 | 70.5       |                              | 4.0                             | 1.0                        | 7.0           | 0            | 0.9                        | 6              |  |         |
| 12          | 121                                        | -8                                   | 22                   |                |      | PS                        | 9-21-46                 | 71.5       |                              | 18.0                            | 4.0                        | 6.0           | 0            | 0                          | 15             |  |         |
| 13          | 30                                         | Flowing                              |                      |                |      | PS                        | 9-21-46                 | 69.0       |                              | 32.0                            | 1.0                        | 6.0           | 0            | 0.1                        | 18             |  |         |
| 14          | 145                                        |                                      |                      |                |      | PS                        | 9-21-46                 | 69.0       |                              | 10.0                            | 1.0                        | 5.0           | 0            | 3.1                        | 18             |  |         |
| 15          | 140                                        |                                      |                      | 15             |      | PS                        | 9-21-46                 | 69.0       |                              | 3.0                             | 1.0                        | 3.0           | 0            | 0                          | 6              |  |         |
| 16          | 70                                         | -26                                  | 44                   |                | 500  | PS                        | 8-21-46                 | 70.5       |                              | 4.0                             | 1.0                        | 6.0           | 0            | 2.7                        | 3              |  |         |
| 17          | 70                                         | -25                                  | 45                   |                | 100  | PS                        |                         | 70.0       |                              |                                 |                            |               |              |                            |                |  |         |
| 18          | 70                                         | -20                                  | 50                   |                | 300  | PS                        |                         | 70.0       |                              |                                 |                            |               |              |                            |                |  |         |
| 19          | 52                                         | +16                                  | 24                   |                | 500  | PS                        | 9-21-46                 | 70.0       |                              | 4.0                             | 1.0                        | 5.0           | 0            | 1.8                        | 6              |  |         |
| 20          | 8                                          | -8                                   | 2                    | 50             |      | PS                        | 3-24-47                 | 69.0       |                              | 10.0                            | 7.0                        | 10.0          | 0.2          | 0.2                        | 240            |  |         |
| 21          | 10                                         |                                      |                      |                | 50   | PS                        | 10- 4-46                | 70.0       |                              | 10.0                            | 1.0                        | 8.0           | 0.0          | 0.1                        | 9              |  |         |
| 22          | 22                                         |                                      |                      |                |      | PS                        | 10- 4-46                | 70.0       | 0                            | 5.0                             | 5.0                        | 10.0          | 0.0          | 0.1                        | 12             |  |         |
| 23          | 6                                          | + 2.5                                | 8.5                  | 30             |      | PS                        | 9-12-46                 | 67         |                              | 7                               | 9                          | 144           | 0.0          | 0                          | 62             |  |         |
| 24          | 9                                          | + 1±                                 | 10                   | 5±             |      | PS                        | 5-12-48                 | 73         |                              | 75                              | 6                          | 6             | 0.2          | .7                         | 37             |  |         |
| 25          | 9                                          | + 1±                                 | 10                   | 5±             | 250  | PS                        | 5-12-48                 | 73         |                              |                                 |                            |               |              |                            |                |  |         |
| 26          | 8                                          | + 10±                                | 18                   | 45             | 1000 | I                         | 7-10-46                 | 71         |                              | 194                             | 13                         | 14            | 0.1          | 0.3                        | 162            |  |         |
| 27          | 12                                         | - 5                                  | 7                    |                |      | PS                        | 8-21-48                 | 70         |                              |                                 |                            |               |              |                            |                |  |         |

Abbreviations: D, domestic; PS, public supply; Ind., industrial.



TABLE 2  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## BARBOUR COUNTY

| Well Number | Location                            | Owner or name                     | Driller            | Type of well | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                     |
|-------------|-------------------------------------|-----------------------------------|--------------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|---------------------------------------------|
| 1           | Below water tower                   | Louisville No. 1                  | Gray Artesian      | D            | 280                  | 8                        |                       | Providence sand                                | Drilled Sept., 1946.                        |
| 2           | 25 yds. SE of well 1                | Louisville No. 2                  | Gray Artesian      | D            | 307                  | 15-6                     | 307                   | Providence sand                                | Drilled 1926.                               |
| 3           | Below water tower                   | Clio No. 1                        | Gray Artesian      | D            | 365                  | 8                        |                       | Clayton fm.                                    | Drilled 1948.                               |
| 3-A         | Below water tower                   | Clio No. 2                        | Gray Artesian      | D            | 454                  | 10-8                     | 454                   | Providence sand ?                              |                                             |
| 4           | Blue Springs                        | Blue Springs                      | Spring             |              |                      |                          |                       | Clayton fm.                                    | Furnishes water to town. On Whigham Estate. |
| 5           | Texasville                          | J. D. Gary                        | Smith              | J            | 93                   | 2                        | 85                    | Nanafalia fm.                                  | Representative well in area.                |
| 6           | At City Water Works                 | Clayton                           | Layne-Central      | D            | 200                  | 18-8                     | 200                   | Providence sand                                | Drilled Aug., 1929.                         |
| 7           | 10 yds. SE of well 6                | Clayton                           | Layne-Central      | D            | 204                  | 18-8                     |                       | Providence sand                                | Drilled 1946.                               |
| 8           | 1 mi. SW of Clayton                 | Mrs. Stanley Baker                | Peerson Drill. Co. | D            | 173                  | 4                        | 173                   | Providence sand                                | Drilled Sept. 17, 1946.                     |
| 9           | 5 mi. NW of Clayton                 | Barbour Co. Negro Training School | Peerson Drill. Co. | D            | 194                  | 4                        | 194                   | Providence sand                                | Drilled Sept. 20, 1946.                     |
| 10          | 0.2 mi. NE of Baker Hill postoffice | J. Y. Johnston                    | Smith              | J            | 120                  | 2                        | 115                   | Nanafalia fm.                                  |                                             |
| 11          | 75 yds. W of Baker Hill postoffice  | J. Y. Johnston                    | Smith              | J            | 98                   | 2                        | 98                    | Nanafalia fm.                                  |                                             |

<sup>1</sup>Abbreviations: J, jetted; D, drilled; Dr, driven.

<sup>2</sup>Abbreviations: fm., formation; res., residuum; ls., limestone.



TABLE 2—Continued

Analyses by G. A. Billingsley, D. M. Parrish, W. T. Platt  
Parts per million

## BARBOUR COUNTY

| Well data   |                                      |                      |                |       |              |                    |            |                              |                                 | Chemical analyses          |               |              |                            |                | Remarks                                                           |
|-------------|--------------------------------------|----------------------|----------------|-------|--------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|-------------------------------------------------------------------|
| Well number | Water level                          |                      | Yield (g.p.m.) |       | Use of water | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |                                                                   |
|             | Above + or below—land surface (feet) | Above mean sea level | Flow           | Pump  |              |                    |            |                              |                                 |                            |               |              |                            |                |                                                                   |
| 1           | 543                                  | —105                 | 438            | 30    | PS           | 7-10-46            | 66         |                              | 149                             | 6                          | 7             | .0           | 1.3                        | 126            | Slight sediment.                                                  |
| 2           | 544                                  | —138                 | 406            | 75    | PS           | 7-10-46            | 66         |                              | 91                              | 3                          | 4             | .0           | 3.2                        | 84             | Pumping level —230 ft.<br>Under construction.<br>Estimated yield. |
| 3           | 523 ±                                | —190                 | 333            | 50    | PS           |                    |            |                              |                                 |                            |               |              |                            |                |                                                                   |
| 3-A         | 520 ±                                |                      |                |       | PS           | 7-10-46            | 68         |                              | 136                             | 6                          | 4             | .0           | 6.5                        | 126            |                                                                   |
| 4           |                                      |                      |                | 5,000 | PS           | 7-10-46            |            |                              |                                 |                            |               |              |                            |                |                                                                   |
| 5           |                                      | —45                  |                | 7     | D-S          | 7-10-46            |            |                              | 21                              | 2                          | 8             | .0           | 11                         | 33             |                                                                   |
| 6           | 598                                  | —146                 | 452            | 100   | PS           | 7-10-46            | 66         |                              | 22                              | 2                          | 7             | .0           | 11                         | 34             |                                                                   |
| 7           | 596                                  | —144                 | 452            | 170   | PS           | 7-10-46            | 66         |                              |                                 |                            |               |              |                            |                |                                                                   |
| 8           | 583                                  | —110                 | 473            |       | D-S          | 9-17-46            | 66         |                              |                                 |                            |               |              |                            |                |                                                                   |
| 9           |                                      | —130                 |                |       | PS           | 3-24-47            | 70         |                              | 68                              | Trace                      | 6             | 0.2          | 0.2                        | 32             | Causes yellow stain.                                              |
| 10          |                                      | —102                 |                | 7     | D-S          | 7-10-46            | 71         |                              | 7                               | 2                          | 4             | .0           | 1.1                        | 6              |                                                                   |
| 11          |                                      | —88                  |                | 3     | D-I-S        | 7-10-46            | 71         |                              |                                 |                            |               |              |                            |                |                                                                   |

Abbreviations: PS, public supply; I, industrial; S, stock; D, domestic.



TABLE 3  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## BUTLER COUNTY

| Well Number | Location                          | Owner or name        | Driller            | Type of well | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                           |
|-------------|-----------------------------------|----------------------|--------------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|---------------------------------------------------|
| 1           | 1 mi. E. of Greenville            | Beeland Bros.        | Gray Artesian      | D            | 761                  | 4                        |                       | Ripley (?) fm.                                 |                                                   |
| 2           | 150 yds. N. of pumping station    | Greenville           | Layne-Central      | D            | 546                  | 8                        | 546                   | Ripley-Cusseta                                 | Drilled in 1931. Has 60 ft. of screen.            |
| 3           | 50 yds. E. of pumping station     | Greenville           | Layne-Central      | D            | 598                  | 12-8                     | 579                   | Ripley-Cusseta                                 | Drilled Dec., 1942. Operating water level 292 ft. |
| 4           | At pumping station                | Greenville           | American Pipe Mfg. | D            | 680                  | 10                       | 80                    | Ripley-Cusseta                                 | Drilled 1900. Operating water level 110 ft.       |
| 5           | Chapman, next to water tower      | W. T. Smith Lbr. Co. | Layne-Central      | D            | 865                  | 16-8                     | 861                   | Ripley-Cusseta                                 | Drilled in 1944.                                  |
| 6           | Chapman, 100 yds. S. of R.R. Sta. | W. T. Smith Lbr. Co. | L. & N. R.R. Co.   | D            | 210                  | 8                        | 190                   | Nanafalia fm.                                  | Drilled in 1920.                                  |
| 7           | At old pump house E. of R.R.      | Georgiana            |                    | D            | 285                  | 8                        |                       | Nanafalia fm.                                  | Drilled 700 ft. deep originally.                  |
| 8           | 1½ blocks N. of R.R. Sta.         | Georgiana            |                    | D            | 340                  | 6                        |                       | Nanafalia fm.                                  | Drilled in 1911.                                  |
| 9           | 100 yds. S. of postoffice         | Garland              |                    | D            | 280                  | 4                        |                       | Tuscahoma sand                                 | Drilled in 1945.                                  |
| 10          | Below water tower                 | McKenzie             | W. J. Bozeman      | D            | 330                  | 6                        | 94                    | Tuscahoma sand                                 | Drilled in 1947.                                  |
| 11          | Near City Hall                    | Georgiana            | H. W. Pearson Co.  | D            | 1,045                | 18                       | 1,045                 | Ripley-Cusseta                                 |                                                   |

<sup>1</sup>Abbreviations: J, jetted; D, drilled; Dr, driven.

<sup>2</sup>Abbreviations: fm., formation; res., residuum; ls., limestone.



TABLE 3—Continued

Analyses by G. A. Billingsley, D. M. Parrish, and Merle E. Schroeder  
Parts per million

## BUTLER COUNTY

| Well data   |                                                   |                               |                |      | Chemical analyses         |                         |            |                              |                                 |                            |               |              |                            |                | Remarks |
|-------------|---------------------------------------------------|-------------------------------|----------------|------|---------------------------|-------------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|---------|
| Well number | Water level                                       |                               | Yield (g.p.m.) |      | Use of <sup>1</sup> water | Date of collec-<br>tion | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |         |
|             | Above +<br>or below—<br>land<br>surface<br>(feet) | Above<br>mean<br>sea<br>level | Flow           | Pump |                           |                         |            |                              |                                 |                            |               |              |                            |                |         |
| 1           |                                                   |                               |                |      | Ind.-S.                   | 7-29-46                 | 72         | 7.9                          | 249                             | 32                         | 34            | .8           | .1                         | 21             |         |
| 2           | 380                                               | —109                          | 271            | 330  | PS                        | 7-29-46                 | 72         | 22                           |                                 | 34                         | 73            | .6           | 0                          | 9              |         |
| 3           | 367                                               | —136                          | 231            | 575  | PS                        | 7-29-46                 | 72         |                              |                                 |                            |               |              |                            |                |         |
| 4           | 367                                               | —65                           | 302            | 225  | PS                        | 7-29-46                 | 72         |                              |                                 |                            |               |              |                            |                |         |
| 5           | 272                                               | —24                           | 248            | 585  | Ind.-PS                   | 7-29-46                 | 78         | 28                           | 258                             | 18                         | 54            | .9           | 1.2                        | 9              |         |
| 6           | 264                                               | + 6.5                         | 270.5          | 25   | Ind.-PS                   | 7-29-46                 | 66         | 0                            | 280                             | 44                         | 5             | .1           | 0                          | 222            |         |
| 7           | 273                                               | —25                           | 248            | 300  | PS                        | 3-24-47                 | 71         |                              | 281                             | 34                         | 12            | .2           | .5                         | 243            |         |
| 8           | 288                                               | —40                           | 248            | 100  | PS                        | 3-24-47                 | 69         |                              | 264                             | 35                         | 8             | .2           | .2                         | 213            |         |
| 9           | 209                                               | + 4.5                         | 213.5          | 1.5  | PS                        | 7-29-46                 | 70         | 6.9                          | 228                             | 12                         | 5             | .4           | .4                         | 45             |         |
| 10          | 457                                               | —220                          | 237            | 50   | PS                        | 7-28-46                 | 72         | 5.9                          | 291                             | 66                         | 7             | .4           | .8                         | 36             |         |
| 11          | 289                                               | —62                           | 227            | 360  | PS                        | 10-7-47                 | 78         | 15                           | 281                             | 12                         | 68            | 1.1          | .3                         | 5.3            |         |

<sup>1</sup>Abbreviations: PS, public supply; Ind., industrial; S, stock.



TABLE 4  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

| Well Number | Location                                | Owner or name               | Driller          | Type of Well <sup>1</sup> | Depth of Well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                   |
|-------------|-----------------------------------------|-----------------------------|------------------|---------------------------|----------------------|--------------------------|-----------------------|------------------------------------------------|-------------------------------------------|
| 1           | Choctaw City                            | Consolidated School         | W. R. Harmon     | J                         | 100                  | 4                        | 70                    | Nanafalia fm.                                  | Jetted in 1925. White sand 70 to 90 ft.   |
| 2           | Cromwell                                | J. T. Allen Sawmill         | J. E. Harmon     | J                         | 42                   | 3                        | 18                    | Nanafalia fm.                                  | Jetted in 1929. White sand 30 to 40 ft.   |
| 3           | Lisman                                  | Choctaw Co. Training School | W. R. Harmon     | J                         | 230                  | 3                        | 60                    | Nanafalia fm.                                  | White sand 210 to 230 ft.                 |
| 4           | Riderwood                               | Black Belt Lbr. Co.         | J. E. Harmon     | J                         | 137                  | 4                        | 40                    | Tuscahoma sand                                 | Jetted in 1917. Sand 125 to 137 ft.       |
| 5           | Butler                                  | Town well                   | Cook & Runion    | D                         | 520                  | 8                        | 508                   | Nanafalia fm.                                  | Depth measured 6-26-46, 328 ft.           |
| 6           | ½ mi. S. of Lavaca                      | W. C. Tillman               | J. E. Harmon     | J                         | 190                  | 3                        | 60                    | Nanafalia fm.                                  | Jetted in 1928. White sand 170 to 190 ft. |
| 7           | 1 mi. E. of Lavaca                      | C. A. Ezell                 | W. R. Harmon     | J                         | 160                  | 2½                       | 40                    | Nanafalia fm.                                  | Jetted in 1924.                           |
| 8           | Yantley, NW¼, sec. 28, T. 15 N., R. 4 W | Ulmer Mosley                | Alec McLendon    | D                         | 270                  | 3                        | 60                    | Tuscahoma sand                                 | Overflowed at base of hill.               |
| 9           | ½ mi. N. of Mt. Sterling                | L. R. Tillman               | W. R. Harmon     | J                         | 465                  | 4½                       | 40                    | Nanafalia fm.                                  | Jetted in 1930.                           |
| 10          | Needham                                 | Town                        | Terry            | D                         | 240                  | 3                        | 60                    | Tuscahoma (?) sand                             |                                           |
| 11          | Gilbertown                              | S. L. Fleming               | J. Downey        | J                         | 220                  | 4                        | 60                    | Lisbon (?) fm.                                 | Drilled in 1921.                          |
| 12          | At old Souwilpa School                  | Souwilpa School             | G. G. Singley    | D                         | 40                   | 1                        |                       | Tallahatta (?) fm.                             | Several flowing wells in area.            |
| 13          | Silas                                   | J. D. Norton                | G. G. Singley    | D                         | 203                  | 4                        | 80                    | Tallahatta fm.                                 | Drilled in 1933.                          |
| 14          | Silas                                   | S. Choctaw Co. Hi School    | J. Downey        | J                         | 222                  | 4                        | 85                    | Tallahatta fm.                                 | Drilled in 1932.                          |
| 15          | Bladon Springs                          | School                      | J. Downey        | J                         | 40                   | 1¾                       |                       | Alluvium                                       | Drilled in 1940.                          |
| 16          | Red Springs                             | Choctaw Co. School          | Deep Well Drill. | D                         | 1185                 | 4                        | 1160                  | Tuscahoma sand                                 | Drilled in 1947.                          |

<sup>1</sup>Abbreviations: J, jetted; D, drilled; Dr, driven.

<sup>2</sup>Abbreviations: fm., formation; res., residuum; ls., limestone.



TABLE 4—Continued

Analyses by G. A. Billingsley, E. W. Lohr, D. M. Parrish, and Merle E. Schroeder  
Parts per million

## CHOCTAW COUNTY

| Well number | Well data                            |                      |                | Chemical analyses |                    |            |                              |                                 |                            |               |              |                            |                | Remarks           |
|-------------|--------------------------------------|----------------------|----------------|-------------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|-------------------|
|             | Water level                          |                      | Yield (g.p.m.) | Use of water      | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |                   |
|             | Above + or below—land surface (feet) | Above mean sea level |                |                   |                    |            |                              |                                 |                            |               |              |                            |                |                   |
| 1           |                                      |                      |                | PS                | 3-15-44            | 70         |                              | 148                             | 1                          | 5             | .1           | .4                         | 27             | Slight iron ppt.  |
| 2           |                                      |                      | 3              | Ind.              | 3-15-44            | 66         | 5.9                          | 150                             | 5                          | 12            | .0           | .0                         | 24             |                   |
| 3           | 160                                  | 168                  |                | PS                | 3-15-44            | 68         | 7.9                          | 220                             | 1                          | 20            | .1           | .0                         | 21             |                   |
| 4           | 185                                  |                      |                | PS-Ind.           | 5-17-46            | 68         |                              | 191                             | 25                         | 6             | .0           | .6                         | 87             |                   |
| 5           | 192                                  | 95                   | 40             | PS                | 3-15-44            | 71         | 9.8                          | 384                             | 1                          | 8             | .2           | 1.6                        | 12             |                   |
| 6           | 105                                  | 125 +                |                | D-S               | 3-15-44            | 67         | 16                           | 292                             | 1                          | 75            | .2           | .0                         | 6              |                   |
| 7           | 110                                  | 120                  |                | D-S               | 3-15-44            | 66         | 12                           | 318                             | 1                          | 74            | .3           | .0                         | 9              |                   |
| 8           |                                      |                      | 3              | D-S               | 3-15-44            | 73         |                              | 218                             | 22                         | 4             | .0           | .3                         | 195            | Slight ppt. iron. |
| 9           |                                      |                      | 15             | D-S               | 3-15-44            | 70         | 14                           | 272                             | 1                          | 158           | .1           | .0                         | 12             |                   |
| 10          | 155                                  | 159                  |                | PS                | 5-17-46            | 66         | 12                           | 129                             | 36                         | 1             | .1           | 1.1                        | 12             | Slight iron ppt.  |
| 11          | 125                                  | 118                  | 1 2/5          | Ind.-S            | 3-24-47            |            |                              | 396                             | 7                          | 7             | 1            | 1.8                        | 24             | Slight sediment.  |
| 12          | 124                                  | 126.5                | 7              |                   |                    |            |                              |                                 |                            |               |              |                            |                |                   |
| 13          | 241                                  | 161                  | 2/3            | PS                | 2-25-45            | 66         |                              |                                 |                            |               |              |                            |                |                   |
| 14          | 236                                  | 196                  | 7              | PS                | 3- 2-44            | 70         |                              |                                 |                            |               |              |                            |                |                   |
| 15          |                                      |                      | 3              | PS                | 5-17-46            |            |                              |                                 |                            |               |              |                            |                |                   |
| 16          | 410 ±                                |                      | 20             | PS                | 3-23-44            |            | 9.0                          | 287                             | 1                          | 57            | 0.1          | 0.3                        | 6              |                   |
|             |                                      |                      |                |                   | 6-13-47            |            |                              | 308                             | 2                          | 4             | .2           | 1.4                        | 69             |                   |

<sup>1</sup>Abbreviations: PS, public supply; Ind., industrial; S, stock; D, domestic.



TABLE 5  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## CLARKE COUNTY

| Well Number | Location                       | Owner or name | Driller          | Type of well | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                |
|-------------|--------------------------------|---------------|------------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|----------------------------------------|
| 1           | Thomasville                    | Town well 1   | Layne-Central    | D            | 95                   | 18-8                     | 95                    | Tusahoma (?) sand                              | Drilled in Feb., 1934.                 |
| 2           | Thomasville                    | Town well 2   | Layne-Central    | D            | 89                   | 18-8                     | 89                    | Tusahoma (?) sand                              | Drilled in 1935.                       |
| 3           | Thomasville                    | Town well 3   | Layne-Central    | D            | 702                  | 10                       | 667                   | Nanafalia fm.                                  | Drilled in 1944. Screen 667 to 702 ft. |
| 4           | Thomasville                    | Exchange Club | Peerson Drill.   | D            |                      |                          |                       | Nanafalia fm.                                  | Unfinished.                            |
| 5           | Grove Hill                     | Town well 1   | Gray Artesian    | D            | 148                  | 8                        | 105                   | Terrace sands                                  | Screen 105 to 145 ft.                  |
| 6           | Grove Hill                     | Town well 2   | Gray Artesian    | D            | 146                  | 8                        | 126                   | Terrace sands                                  | Screen 126 to 146 ft.                  |
| 7           | SW ¼, sec. 3, T. 7 N., R. 2 W. | J. G. McLean  | Deep Well Drill. | D            | 247                  | 6-4                      | 209                   | Oligocene ls.                                  | Cable tool, 1946.                      |
| 8           | Jackson                        | Town well 1   | Gray Artesian    | D            | 140                  | 10                       | 80                    | Miocene sands                                  | Drilled in 1923. Now abandoned.        |
| 9           | Jackson                        | Town well 2   | Gray Artesian    | D            | 171                  | 10                       | 40                    | Miocene sands                                  | Drilled in 1941.                       |
| 10          | Jackson                        | Town well 3   | Peerson Drill.   | D            | 279                  | 12-8                     | 270                   | Miocene and Oligocene (?) sands                | Drilled in May, 1948.                  |

<sup>1</sup>Abbreviations: J, jetted; D, drilled; Dr, driven.

<sup>2</sup>Abbreviations: fm., formation; res., residuum; ls., limestone.



TABLE 5—Continued

Analyses by Evelyn Holloman and V. T. McNamara  
Parts per million

## CLARKE COUNTY

| Well number | Well data                                   |                         |                |      | Chemical analyses |                    |            |                              |                                 |                            |               |              |                            |                | Remarks |
|-------------|---------------------------------------------|-------------------------|----------------|------|-------------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|---------|
|             | Water level                                 |                         | Yield (g.p.m.) |      | Use of water      | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |         |
|             | Above + or below—<br>land surface<br>(feet) | Above mean<br>sea level | Flow           | Pump |                   |                    |            |                              |                                 |                            |               |              |                            |                |         |
| 1           | 380                                         | — 60                    | 320            |      | PS                | 68                 |            |                              | 6                               | 10                         | 4             | .1           | .0                         | 12             |         |
| 2           | 370                                         | — 50                    | 320            |      | PS                | 68                 |            |                              | 593                             | 2                          | 375           | 1.2          |                            | 22             |         |
| 3           | 360                                         | —220                    | 140            |      | PS                | 72                 | 8.9        |                              |                                 |                            |               |              |                            |                |         |
| 4           |                                             |                         |                |      |                   |                    |            |                              |                                 |                            |               |              |                            |                |         |
| 5           | 497                                         |                         |                | 130  | PS                | 68                 |            |                              |                                 |                            |               |              |                            |                |         |
| 6           | 497                                         |                         |                | 200  | PS                | 68                 |            |                              | 6                               | 1                          | 3             | 0            | 6.4                        | 12             |         |
| 7           |                                             |                         |                | 6    | D                 |                    |            |                              |                                 |                            |               |              |                            |                |         |
| 8           | 402                                         | —146                    |                |      | PS                | 69                 |            |                              |                                 |                            |               |              |                            |                |         |
| 9           | 225                                         | —127                    | 100            | 100± | PS                | 69                 |            |                              |                                 |                            |               |              |                            |                |         |
| 10          | 229                                         | —125                    | 100            | 123  | PS                | 69                 |            |                              | 3                               | 2                          | 10            | 0            | 17                         | 22             |         |
|             |                                             | —128                    | 101            | 275  | PS                |                    |            |                              |                                 |                            |               |              |                            |                |         |

Abbreviations: PS, public supply; D, domestic.



TABLE 6  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## COFFEE COUNTY

| Well Number | Location     | Owner or name    | Driller           | Type of well | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                        |
|-------------|--------------|------------------|-------------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|------------------------------------------------|
| 1           | Roeton       | N. J. Prestwood  |                   | D            | 180                  | 4                        | 50                    | Nanafalia fm.                                  | Drilled in 1910. White sand 150 ft.            |
| 2           | New Hope     | James Wilson     | Wallace Law       | D            | 65                   | 3                        | 60                    | Tuscahoma sand                                 | Screen 60 to 65 ft.                            |
| 3           | New Hope     | New Hope School  | Wallace Law       | D            | 112                  | 4                        | 112                   | Tuscahoma sand                                 |                                                |
| 4           | Elba         | Court House Well | W. L. Morrison    | D            | 150                  |                          |                       | Tuscahoma sand                                 | Drilled in 1899.                               |
| 5           | Elba         | Town well 1      | S. S. Chandler    | D            | 293                  | 12-10                    |                       | Nanafalia fm.                                  | Drilled in 1904.                               |
| 6           | Elba         | Town well 2      |                   | D            | 250                  | 10                       |                       | Nanafalia fm.                                  | Town wells 1 and 2 flow into cement reservoir. |
| 7           | Elba         | Town well 3      | Ernest Owens      | D            | 557                  | 5-4                      | 300                   | Clayton (?) fm.                                | Drilled in 1927.                               |
| 8           | New Brockton | Town well 1      | Layne-Central     | D            | 358                  | 12                       |                       | Lisbon (?) fm.                                 | Drilled in 1941.                               |
| 9           | Enterprise   | Town well 1      | Frank Sutter      | D            | 398                  | 6                        | 398                   | Tallahatta fm.                                 | Drilled in 1903.                               |
| 10          | Enterprise   | Town well 2      | Gray Artesian Co. | D            | 682                  | 8-6                      | 682                   | Nanafalia fm.                                  | Drilled in 1921.                               |
| 11          | Enterprise   | Town well 3      | Gray Artesian Co. | D            | 606                  | 12-6                     | 425                   | Nanafalia fm.                                  | Drilled in 1934.                               |
| 12          | Enterprise   | Town well 4      | Layne-Central     | D            | 770                  | 18-8                     |                       | Nanafalia fm.                                  | Drilled in 1944.                               |
| 13          | Kinston      | W. L. Stephens   |                   | Dug          | 23                   |                          | 23                    | Res. of Ocala ls.                              | Sinkhole topography.                           |

<sup>1</sup>Abbreviations: J, jetted; D, drilled; Dr, driven.

<sup>2</sup>Abbreviations: fm., formation; res., residuum; ls., limestone.



TABLE 6—Continued  
Analyses by Merle E. Schroeder and W. T. Platt  
Parts per million  
COFFEE COUNTY

| Well data   |                                                   |                               |                |      | Chemical analyses         |                         |            |                              |                                 |                            |               |              |                            |                | Remarks               |
|-------------|---------------------------------------------------|-------------------------------|----------------|------|---------------------------|-------------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|-----------------------|
| Well number | Water level                                       |                               | Yield (g.p.m.) |      | Use of <sup>1</sup> water | Date of collec-<br>tion | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |                       |
|             | Above +<br>or below—<br>land<br>surface<br>(feet) | Above<br>mean<br>sea<br>level | Flow           | Pump |                           |                         |            |                              |                                 |                            |               |              |                            |                |                       |
| 1           |                                                   | — 60                          |                | 5    | D                         | 7-11-46                 | 68         |                              | 22                              | 2                          | 3             | .0           | .2                         | 21             | Log available.        |
| 2           |                                                   | — 52                          |                | 3    | D                         | 7-11-46                 |            |                              |                                 |                            |               |              |                            |                |                       |
| 3           |                                                   | — 61                          |                | 15   | PS                        | 7-11-46                 | 69         |                              |                                 |                            |               |              |                            |                |                       |
| 4           | 191                                               | + 5                           |                |      | PS                        | 7-11-46                 | 68         |                              |                                 |                            |               |              |                            |                |                       |
| 5           | 192                                               | — 4                           | 196            |      | PS                        | 7-11-46                 | 68         |                              |                                 |                            |               |              |                            |                |                       |
| 6           | 192                                               | — 4                           | 188            |      | PS                        | 7-11-46                 | 69         |                              | 221                             | 18                         | 7             | .1           | .6                         | 114            | Pumping level 290 ft. |
| 7           | 192                                               | + 52                          | 244            |      | PS                        | 7-11-46                 | 70         |                              | 132                             | 10                         | 5             | .1           | .3                         | 132            |                       |
| 8           | 459                                               | —242                          | 217            | 110  | PS                        | 7-11-46                 |            |                              |                                 |                            |               |              |                            |                |                       |
| 9           | 358                                               | —127                          |                | 100  | PS                        | 7-11-46                 |            |                              |                                 |                            |               |              |                            |                |                       |
| 10          | 358                                               |                               |                |      | PS                        | 7-11-46                 |            |                              |                                 |                            |               |              |                            |                |                       |
| 11          | 358                                               |                               |                |      | PS                        | 7-11-46                 |            |                              |                                 |                            |               |              |                            |                |                       |
| 12          | 354                                               | —163                          |                | 560  | PS                        | 7-11-46                 | 74         | 0                            | 166                             | 8                          | 1             | .1           | .1                         | 110            | 28 ft. drawdown.      |
| 13          |                                                   | — 13.9                        |                | 4    | D                         | 7-26-46                 | 73         | 0                            | 2                               | 1                          | 18            | .0           | .22                        | 32             |                       |

<sup>1</sup>Abbreviations: PS, public supply; D, domestic.



TABLE 7  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## CONECUH COUNTY

| Well Number | Location    | Owner or name    | Driller        | Type of well | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                         |
|-------------|-------------|------------------|----------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|---------------------------------|
| 1           | Evergreen   | Town well 1      | Gray Artesian  | D            | 232                  | 8                        | 232                   | Lisbon fm.                                     | Drilled in 1926. Log available. |
| 2           | Evergreen   | Town well 2      | Layne-Central  | D            | 455                  | 12-8                     |                       | Tallahatta (?) fm.                             | Drilled in 1939. Log available. |
| 3           | Belleville  | C. T. Livingston | Neal Peary     | D            | 54                   | 6                        | 54                    |                                                | Drilled in 1936.                |
| 4           | Repton      | Town well        | H. B. Booker   | D            | 65                   | 2                        | 60                    | Miocene sands                                  | Located in front of R.R. Sta.   |
| 5           | Repton      | School well      | H. B. Booker   | D            | 85                   | 2                        | 80                    | Miocene sands                                  | Screen 80 to 85 ft.             |
| 6           | Castleberry | Town well 1      | Gray Artesian  | D            | 256                  | 8                        | 121                   | Gosport (?) sand                               | Drilled in 1935.                |
| 7           | Brooklyn    | E. C. Knowles    | F. O. McCreary | D            | 250                  | 4                        | 250                   | Tallahatta (?) fm.                             | Drilled in 1935.                |
| 8           | Brooklyn    | School well      | F. O. McCreary | D            | 250                  | 4                        | 250                   | Tallahatta (?) fm.                             | Drilled in 1935.                |

<sup>1</sup>Abbreviations: D, drilled.

<sup>2</sup>Abbreviations: fm., formation.



TABLE 7—Continued  
Analyses by R. H. Dellett  
Parts per million  
CONECUH COUNTY

| Well number | Well data                                   |                            |                | Chemical analyses         |                         |            |                              |                                 |                            |               |              |                            |                |                         | Remarks |
|-------------|---------------------------------------------|----------------------------|----------------|---------------------------|-------------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|-------------------------|---------|
|             | Water level                                 |                            | Yield (g.p.m.) | Use of <sup>1</sup> water | Date of collec-<br>tion | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |                         |         |
|             | Above + or below—<br>land surface<br>(feet) | Above<br>mean<br>sea level |                |                           |                         |            |                              |                                 |                            |               |              |                            |                |                         |         |
| 1           | 277                                         | —80                        | 100            | PS                        | 9-11-46                 | 69         |                              | 148                             | 5                          | 4             | 0            | .1                         | 117            | .27 ppm. iron (in ppt.) |         |
| 2           | 287                                         | —90                        | 300            | PS                        | 9-11-46                 | 69         |                              | 142                             | 8                          | 4             | 0            | .1                         | 114            | .24 ppm. iron (in ppt.) |         |
| 3           | 418                                         | —46                        | 12             | D                         | 9-11-46                 | 70         |                              | 60                              | 8                          | 55            | 0            | 23                         | 58             |                         |         |
| 4           | 316±                                        | —54                        | 4              | PS                        | 9-11-46                 | 72         |                              | 5                               | 1                          | 17            | .1           | 16                         | 22             | 2.5 ppm. iron (in ppt.) |         |
| 5           | 351                                         | —60                        | 12             | PS                        | 9-11-46                 | 70         |                              | 6                               | 1                          | 5             | 0            | 1.5                        | 12             | 2.0 ppm iron (in ppt.)  |         |
| 6           | 165                                         | +24                        | 500            | PS                        | 9-11-46                 |            |                              | 144                             | 4                          | 4             | .4           | 0                          | 111            | .25 ppm iron (in ppt.)  |         |
| 7           |                                             | +14                        | 15             | PS                        | 9-11-46                 | 72         |                              | 166                             | 5                          | 4             | 0            | 0                          | 100            |                         |         |
| 8           |                                             | +12                        | 15             | PS                        | 9-11-46                 | 72         |                              |                                 |                            |               |              |                            |                |                         |         |

<sup>1</sup>Abbreviations: PS, public supply; D, domestic.



TABLE 8  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## COVINGTON COUNTY

| Well Number | Location  | Owner or name    | Driller       | Type of well <sup>1</sup> | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                             |
|-------------|-----------|------------------|---------------|---------------------------|----------------------|--------------------------|-----------------------|------------------------------------------------|-------------------------------------|
| 1           | Red Level | Town Spring      |               |                           |                      |                          |                       |                                                | Town uses spring for water supply.  |
| 2           | Gantt     | School well      | Soules        | Dug                       | 45                   | 48                       |                       | Tallahatta fm.                                 | Drilled in 1920. Casing perforated. |
| 3           | Andalusia | Town well 1      | Gray Artesian | D                         | 405                  | 8                        | 405                   | Lisbon fm.                                     | Drilled in 1942.                    |
| 4           | Andalusia | Town well 2      | Layne-Central | D                         | 335                  | 18-8                     | 335                   | Lisbon fm.                                     | Drilled in 1946.                    |
| 5           | Andalusia | Town well 3      | Layne-Central | D                         | 308                  | 18-8                     | 308                   | Lisbon fm.                                     | Drilled in 1947.                    |
| 6           | Andalusia | Town well 4      | Layne-Central | D                         | 464                  | 18-8                     | 464                   | Lisbon fm.                                     | Drilled in 1948.                    |
| 6-A         | Andalusia | Town well 5      | Layne-Central | D                         | 493                  | 18-10                    | 493                   | Tuscahoma fm.                                  | Now capped and abandoned.           |
| 7           | Opp       | Town well 1      | Gray Artesian | D                         | 200 ±                | 10-6                     |                       | Lisbon fm.                                     | Drilled in 1929.                    |
| 8           | Opp       | Town well 2      | Gray Artesian | D                         | 211                  | 12                       |                       | Lisbon fm.                                     | Drilled in 1946.                    |
| 9           | Opp       | Town well 3      | Layne-Central | D                         | 337                  | 16-8                     | 387                   | Lisbon fm.                                     | Drilled in 1929.                    |
| 10          | Opp       | Opp Cotton Mill  | Gray Artesian | D                         | 210                  | 10-4                     | 142                   | Lisbon fm.                                     | Drilled in 1945.                    |
| 11          | Opp       | Opp Cotton Mill  | Layne-Central | D                         | 278                  | 16-8                     | 278                   | Lisbon fm.                                     | Drilled in 1903.                    |
| 12          | Lockhart  | Jackson Lbr. Co. |               | D                         | 360                  | 6                        |                       | Ocala ls.                                      | Supplies town.                      |
| 13          | Lockhart  | Jackson Lbr. Co. |               | D                         | 360                  | 6                        |                       | Ocala ls.                                      | Supplies town.                      |
| 14          | Floral    | Town well 1      | Fountain      | D                         | 400                  | 10                       |                       | Ocala ls.                                      | Drilled in 1908.                    |
| 15          | Floral    | Town well 2      | Layne-Central | D                         | 602                  | 16-8                     | 602                   | Lisbon fm.                                     | Drilled in 1948.                    |

<sup>1</sup>Abbreviations: D, drilled.

<sup>2</sup>Abbreviations: fm, formation; ls, limestone.



TABLE 8—Continued

Analyses by W. T. Platt  
Parts per million

## COVINGTON COUNTY

| Well data   |                                      |                      |                | Chemical analyses |                    |            |                              |                                 |                            |               |              | Remarks |                            |                    |
|-------------|--------------------------------------|----------------------|----------------|-------------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|---------|----------------------------|--------------------|
| Well number | Water level                          |                      | Yield (g.p.m.) |                   | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) |         | Nitrate (NO <sub>3</sub> ) | Total hardness     |
|             | Above + or below—land surface (feet) | Above mean sea level | Flow           | Pump              |                    |            |                              |                                 |                            |               |              |         |                            |                    |
| 1           | 275                                  |                      |                | 90                | 5-27-46            | 72         |                              | 72                              | 8                          | 9             | .0           | 6.2     | 69                         | Used last in 1943. |
| 2           | 239                                  | — 28                 | 211            | 100               | 5-28-46            | 75         |                              | 5                               | 2                          | 4             | .0           | 9.1     | 12                         |                    |
| 3           | 320                                  | —125                 | 195            | 3                 | 5-28-46            | 69         |                              | 122                             | 9                          | 2             | .0           | .6      | 90                         |                    |
| 4           | 341                                  | —136                 | 205            | 150               | 2-28-46            | 71         |                              | 126                             | 8                          | 13            | .1           | .2      | 90                         |                    |
| 5           | 300 ±                                | — 95                 | 205            | 250               | 2-28-46            |            |                              | 54                              | 6                          | 40            | .0           | .0      | 140                        |                    |
| 6           | 302                                  |                      |                | 130               | 2-28-46            |            |                              | 200                             | 4                          | 6.5           | .0           |         | 109                        |                    |
| 6-A         | 164                                  | + 27                 | 137            | 150               | 7-29-48            | 71         | 15                           | 230                             | 1.0                        | 16            | .2           | .3      | 12                         |                    |
| 7           | 317                                  | — 73                 | 244            | 500               | 5-29-46            |            |                              | 88                              | 4                          | 6             | .0           | .9      | 82                         |                    |
| 8           | 316                                  | — 32                 | 284            | 100               | 5-29-46            | 68         |                              |                                 |                            |               |              |         |                            |                    |
| 9           | 326                                  | — 61                 | 265            | 442               | 10-25-46           |            |                              |                                 |                            |               |              |         |                            |                    |
| 10          | 300 ±                                | — 47                 | 253            | 350               | I 10-15-29         |            |                              |                                 |                            |               |              |         |                            |                    |
| 11          | 312                                  | — 65                 | 247            | 250               | I 11- 8-45         |            |                              |                                 |                            |               |              |         |                            |                    |
| 12          |                                      | — 30                 |                | 200               |                    |            |                              |                                 |                            |               |              |         |                            |                    |
| 13          |                                      | — 30                 |                | 300               | 5-29-46            | 72         |                              | 140                             | 2                          | 5             | .0           | .0      | 114                        |                    |
| 14          | 248                                  | — 30                 | 218            | 500               | 5-29-46            | 72         |                              | 176                             | 3                          | 11            | .0           | 3       | 129                        |                    |
| 15          |                                      | — 38                 |                | 350               | 5-29-46            | 66         |                              |                                 |                            |               |              |         |                            |                    |

Used last in 1943.

<sup>1</sup>Abbreviations: PS, public supply; I, industrial.



TABLE 9  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## CRENSHAW COUNTY

| Well Number | Location | Owner or name     | Driller | Type of well | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                   |
|-------------|----------|-------------------|---------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|-------------------------------------------|
| 1           | Luverne  | Town well 1       | Gray    | Artesian     | 135                  | 8                        |                       | Providence sand                                | Drilled in 1925. At ice plant.            |
| 2           | Luverne  | Town well 2       | Gray    | Artesian     | 136                  |                          |                       | Providence sand                                | At ice plant. Well not in use.            |
| 3           | Luverne  | Town well 3       | Gray    | Artesian     | 345                  | 12                       |                       | Cusseta sand                                   | Well undeveloped. Oct. 5, 1945.           |
| 4           | Glenwood | Town well         | Hagler  |              | 240                  | 6                        |                       | Providence sand                                | Drilled in 1909.                          |
| 5           | Glenwood | W. C. Sanders     | Hagler  |              | 249                  |                          |                       | Providence sand                                |                                           |
| 6           | Brantley | Town well 1       | Gray    | Artesian     |                      |                          |                       | Nanafalia fm.                                  |                                           |
| 7           | Brantley | Town well 2       | Gray    | Artesian     | 178                  | 6                        | 120                   | Nanafalia fm.                                  | Drilled in 1945. Log available.           |
| 8           | Dozier   | Town well 1       | Radford |              | 302                  | 4                        | 250                   | Tuscahoma sand                                 | Drilled in 1911. Water in sand at 300 ft. |
| 9           | Dozier   | J. D. Weatherford | Radford |              | 285                  |                          |                       | Tuscahoma sand                                 |                                           |
| 10          | Dozier   | Dozier School     | Radford |              | 320                  | 4                        |                       | Tuscahoma sand                                 |                                           |

<sup>1</sup>Abbreviations: D, drilled.

<sup>2</sup>Abbreviations: fm, formation.



TABLE 9—Continued

Analyses by V. T. McNamara and Merle E. Schroeder  
Parts per million

## CRENSHAW COUNTY

| Well data   |                                      |                      |                |       | Chemical analyses |                    |            |                              |                                 |                            |               |              |                            |                |                       |
|-------------|--------------------------------------|----------------------|----------------|-------|-------------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|-----------------------|
| Well number | Water level                          |                      | Yield (g.p.m.) |       | Use of water      | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness | Remarks               |
|             | Above + or below—land surface (feet) | Above mean sea level | Flow           | Pump  |                   |                    |            |                              |                                 |                            |               |              |                            |                |                       |
| 1           | 343                                  |                      |                | 150   | PS                | 10- 5-45           | 68         |                              | 168                             | 7                          | 25            | .0           | 6.4                        | 105            |                       |
| 2           |                                      |                      |                | 300 ? | I                 | 10- 5-45           |            |                              |                                 |                            |               |              |                            |                |                       |
| 3           | 333                                  |                      |                |       | PS                | 10- 5-45           |            |                              |                                 |                            |               |              |                            |                |                       |
| 4           | 283                                  | 292                  | 15             |       | PS                | 7-28-46            | 67         | 0                            | 155                             | 5                          | 1             | .0           | .0                         |                |                       |
| 5           | 290                                  | 292                  | 1              |       | D                 | 7-28-46            | 67         |                              |                                 |                            |               |              |                            |                |                       |
| 6           | 284                                  |                      |                |       | PS                | 10- 5-45           | 70         | 0                            | 254                             | 12                         | 4             | .0           | .2                         | 138            |                       |
| 7           | 296                                  | 246                  |                | 130   | PS                | 5- 8-47            | 68         |                              | 251                             | 5                          | 4             | .1           | .2                         | 218            |                       |
| 8           | 240                                  | 242                  | 4              |       | PS                | 7-28-46            | 70         | 0                            | 263                             | 19                         | 5             | .2           | .0                         |                | Original flow 60 gpm. |
| 9           | 225                                  | 242                  | 20             |       | D                 | 7-28-46            | 70         |                              |                                 |                            |               |              |                            |                |                       |
| 10          | 240 ±                                |                      | 12             |       | PS                | 7-28-46            | 70         |                              |                                 |                            |               |              |                            |                |                       |

Abbreviations: PS, public supply; I, industrial; D, domestic.



TABLE 10  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## DALE COUNTY

| Well Number | Location                                                        | Owner or name  | Driller       | Type of Well | Depth of Well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                                     |
|-------------|-----------------------------------------------------------------|----------------|---------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|-------------------------------------------------------------|
| 1           | Mixon's Mills                                                   | E. M. Dismukes | B. Fleming    | D            | 265                  | 4                        | 100                   | Providence sand                                | Four flowing wells in area.                                 |
| 2           | Back of wood water tower                                        | Ariton         |               | D            | 260                  | 4                        | 70                    | Nanafalia fm.                                  | Leased by town.                                             |
| 3           | 75 yds. S of well 2                                             | Jack Hutto     |               | D            | 260                  | 4                        | 70                    | Nanafalia fm.                                  |                                                             |
| 4           | 150 yds. W of postoffice                                        | Ariton         | Gray Artesian | D            | 668                  | 8                        | 272                   | Providence sand                                |                                                             |
| 5           | N of Union Ave., at Water Works                                 | Ozark          | Gray Artesian | D            | 450                  | 6                        |                       | Nanafalia (?) fm.                              | Well has been pumped at 100 gpm continuously for 7 weeks.   |
| 6           | 20 yds. S of well 5                                             | Ozark          | Gray Artesian | D            | 525                  | 10                       | 525                   | Nanafalia (?) fm.                              | Casing perforated 295 to 395 ft.; 460 to 490 ft.            |
| 7           | 100 ft. N of City water tower                                   | Ozark          | Layne-Central | D            | 849                  | 16-8                     | 805                   | Providence sand                                | 40 ft. of screen. 10 ft. of draw-down when pumping 197 gpm. |
| 8           | Ozark                                                           | Cowikee Mills  | Layne-Central | D            | 779                  | 12-8                     | 735                   | Providence sand                                | 40 ft. of screen.                                           |
| 9           | Newton                                                          | Town well 1    |               | D            | 700                  | 8                        |                       | Nanafalia fm.                                  | Drilled in 1895. Owner M. F. Wynn.                          |
| 10          | Pinckard                                                        | Town well 1    | Gray Artesian | D            | 745                  | 8                        | 745                   | Nanafalia fm.                                  |                                                             |
| 11          | NE $\frac{1}{4}$ , SW $\frac{1}{4}$ , sec. 14, T. 4 N, R. 23 E. | A. M. Windham  |               | D            | 350                  | 2                        | 350                   | Nanafalia fm.                                  | Supplies 30 families at Daleville.                          |
| 12          | At City pump house                                              | Midland City   | Layne-Central | D            | 552                  | 12                       | 552                   | Tuscahoma (?) sand                             | 44 ft. of drawdown, 80 gpm for 8 hrs.; 40 ft. of screen.    |
| 13          | 25 ft. NE of well 12                                            | Midland City   |               | D            | 80                   | 4 $\frac{1}{2}$          | 80                    | Lisbon fm.                                     | Auxiliary well.                                             |
| 14          | 20 ft. E-NE of well 12                                          | Midland City   |               | D            | 230                  | 6                        | 220                   | Tallahatta fm.                                 | Auxiliary well.                                             |

<sup>1</sup>Abbreviations: D, drilled.

<sup>2</sup>Abbreviations: fm, formation.



TABLE 10—Continued

Analyses by G. A. Billingsley, D. M. Parrish, and W. T. Platt  
Parts per million

## DALE COUNTY

| Well data   |                                      |                      |                |      | Chemical analyses |                    |            |                              |                                 |                            |               |              |                            |                | Remarks                                           |
|-------------|--------------------------------------|----------------------|----------------|------|-------------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|---------------------------------------------------|
| Well number | Water level                          |                      | Yield (g.p.m.) |      | Use of water      | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |                                                   |
|             | Above + or below—land surface (feet) | Above mean sea level | Flow           | Pump |                   |                    |            |                              |                                 |                            |               |              |                            |                |                                                   |
| 1           |                                      |                      | 60             |      | I                 | 7-11-46            | 66         |                              | 167                             | 15                         | 3             | .0           | .4                         | 102            | Supplies swimming pool.<br>1.3 ppm iron (in ppt.) |
| 2           |                                      |                      |                | 15   | PS                | 7-11-46            | 67         |                              | 8                               | 30                         | 4             | .1           | .2                         | 42             |                                                   |
| 3           |                                      |                      |                | 12   | PS                |                    |            |                              |                                 |                            |               |              |                            |                |                                                   |
| 4           |                                      |                      |                | 90   | PS                | 3-24-47            | 68         |                              | 188                             | 14                         | 6             | .2           | .2                         | 138            |                                                   |
| 5           | 411                                  |                      |                | 100  | PS                | 7-11-46            | 70         |                              | 184                             | 8                          | 3             | .0           | .4                         | 120            | Auxiliary air-lift well.                          |
| 6           | 412                                  | 234                  |                | 210  | PS                | 7-11-46            | 68         |                              | 186                             | 8                          | 4             | .0           | .6                         | 129            |                                                   |
| 7           | 442                                  | 232                  |                |      |                   |                    |            |                              |                                 |                            |               |              |                            |                |                                                   |
| 8           | 397                                  | 236                  |                |      | PS                |                    |            |                              |                                 |                            |               |              |                            |                |                                                   |
| 9           |                                      |                      |                | 235  | I                 |                    |            |                              |                                 |                            |               |              |                            |                |                                                   |
| 10          | 381                                  |                      |                | 32   | PS                | 7-11-46            | 70         |                              | 176                             | 15                         | 4             | .0           | .4                         | 132            | .64 ppm iron (in ppt.)                            |
| 11          | 303                                  |                      |                | 23   | PS                | 3-18-46            | 68         |                              | 130                             | 6                          | 5             | .0           | .6                         | 99             |                                                   |
| 12          | 375                                  |                      |                | 7    | PS                | 7-11-46            | 69         | 3.9                          | 122                             | 10                         | 2             | .0           | .2                         | 102            |                                                   |
| 13          | 375                                  | 187                  |                | 80   | PS                | 3-22-46            | 71         |                              | 165                             | 8                          | 7             | .1           | .0                         | 84             |                                                   |
| 14          | 375                                  | 335                  |                |      | PS                |                    |            |                              |                                 |                            |               |              |                            |                |                                                   |
| 4           |                                      | 335                  |                | 24   | PS                |                    |            |                              |                                 |                            |               |              |                            |                |                                                   |

<sup>1</sup>Abbreviations: PS, public supply; I, industrial.



TABLE 11  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

ESCAMBIA COUNTY

| Well Number | Location          | Owner or name     | Driller       | Type of Well <sup>1</sup> | Depth of Well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                |
|-------------|-------------------|-------------------|---------------|---------------------------|----------------------|--------------------------|-----------------------|------------------------------------------------|----------------------------------------|
| 1           | Brewton           | Town well 1       | A. Kimbrough  | D                         | 940                  | 12-4                     | 577                   | Lisbon fm.                                     | Drilled in 1899. Abandoned.            |
| 2           | Brewton           | Town well 2       | Gray Artesian | D                         | 640                  | 10                       | 570                   | Lisbon fm.                                     | Drilled in 1929.                       |
| 3           | Brewton           | Town well 3       | M. H. Holland | D                         | 633                  | 6-4                      | 603                   | Lisbon fm.                                     | Drilled in 1915.                       |
| 4           | Brewton           | Town well 4       | Layne-Central | D                         | 665                  | 16-10                    | 665                   | Lisbon fm.                                     | Drilled in 1948.                       |
| 5           | Fish Hatchery     | Well 1            | M. H. Holland | D                         | 540                  | 4                        | 540                   | Lisbon fm.                                     | Supplies fish ponds.                   |
| 6           | Fish Hatchery     | Well 2            | M. H. Holland | D                         | 560                  | 4                        | 560                   | Lisbon fm.                                     | Supplies fish ponds.                   |
| 7           | Fish Hatchery     | Well 3            | M. H. Holland | D                         | 540                  | 4                        | 540                   | Lisbon fm.                                     | Supplies fish ponds.                   |
| 8           | Flomaton          | Town well         | Gray Artesian | D                         | 148                  | 10                       | 124                   | Miocene sands                                  | Drilled in 1943. Screen 118 to 148 ft. |
| 9           | Atmore            | Town well 1       | Layne-Central | D                         | 129                  | 18                       | 120                   | Miocene sands                                  | Drilled in 1932.                       |
| 10          | Atmore            | Town well 2       | Gray Artesian | D                         | 130                  | 8                        | 92                    | Miocene sands                                  | Drilled in 1935.                       |
| 11          | Atmore            | Town well 3       | Gray Artesian | D                         | 308                  | 10-8                     | 273                   | Miocene sands                                  | Drilled in 1938. Screen 273 to 308 ft. |
| 12          | Atmore            | W. M. Carney Mill | Gray Artesian | D                         | 153                  | 8                        | 60                    | Miocene sands                                  | Drilled in 1923.                       |
| 13          | Atmore            | Town well 4       | Gray Artesian | D                         | 261                  | 12-8                     | 261                   | Miocene sands                                  | Drilled in 1948.                       |
| 14          | 8 mi. N of Atmore | State Prison      | Gray Artesian | D                         | 176                  | 8                        | 176                   | Miocene sands                                  |                                        |
| 15          | 8 mi. N of Atmore | State Prison      | Gray Artesian | D                         | 174                  | 8                        | 174                   | Miocene sands                                  |                                        |
| 16          | 8 mi. N of Atmore | State Prison      | Gray Artesian | D                         | 170                  | 8                        | 170                   | Miocene sands                                  |                                        |

<sup>1</sup>Abbreviations: D, drilled.

<sup>2</sup>Abbreviations: fm, formation.



TABLE 11—Continued

Analyses by Evelyn Holloman and V. T. McNamara  
Parts per million

## ESCAMBIA COUNTY

| Chemical analyses |                                      |                      |                |      |              |                    |            |                              |                                 |                            |               |              |                            |                |            |
|-------------------|--------------------------------------|----------------------|----------------|------|--------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|------------|
| Well number       | Well data                            |                      |                |      | Use of water | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness | Remarks    |
|                   | Water level                          |                      | Yield (g.p.m.) |      |              |                    |            |                              |                                 |                            |               |              |                            |                |            |
|                   | Above + or below—land surface (feet) | Above mean sea level | Flow           | Pump |              |                    |            |                              |                                 |                            |               |              |                            |                |            |
| 1                 | 116±                                 | +15±                 | 141±           | 15±  | PS           | 8-21-45            | 79         |                              | 170                             | 4                          | 3             | .1           | .5                         | 96             | Abandoned. |
| 2                 | 151                                  | +12                  | 163            | 300  | PS           | 8-21-45            | 79         |                              |                                 |                            |               |              |                            |                |            |
| 3                 |                                      | +20±                 |                |      | PS           | 8-21-45            | 78         |                              |                                 |                            |               |              |                            |                |            |
| 4                 | 161                                  | 0                    | 161            | 650  | PS           |                    |            |                              |                                 |                            |               |              |                            |                |            |
| 5                 | 130                                  | +15±                 |                | 60   | I            | 8-21-45            | 75         |                              |                                 |                            |               |              |                            |                |            |
| 6                 | 130                                  | +15±                 |                | 15   | I            | 8-21-45            | 75         |                              |                                 |                            |               |              |                            |                |            |
| 7                 | 130                                  | +15±                 |                | 5    |              |                    |            |                              | 5                               | 2                          | 4             | .0           | .0                         | 8              |            |
| 8                 | 76                                   |                      |                |      | PS           | 8-21-45            | 69         |                              | 5                               | 1                          | 5             | .0           | .0                         | 12             |            |
| 9                 | 289                                  | -18                  |                |      | PS           | 8-21-45            | 69         |                              |                                 |                            |               |              |                            |                |            |
| 10                | 289                                  | -18                  |                |      | PS           | 8-21-45            |            |                              |                                 |                            |               |              |                            |                |            |
| 11                |                                      | +10±                 |                | 160  | PS           | 8-21-45            |            |                              |                                 |                            |               |              |                            |                |            |
| 12                |                                      | -30                  |                |      | I            | 9-25-45            |            |                              |                                 |                            |               |              |                            |                |            |
| 13                |                                      | -22                  |                |      | PS           |                    |            |                              |                                 |                            |               |              |                            |                |            |
| 14                |                                      |                      |                | 250  | PS           |                    |            |                              |                                 |                            |               |              |                            |                |            |
| 15                |                                      |                      |                | 100  | PS           | 7-1-48             | 72         |                              | 96                              | 1                          | 8             | .0           | 7.6                        | 84             |            |
| 16                |                                      |                      |                |      | PS           |                    |            |                              |                                 |                            |               |              |                            |                |            |

<sup>1</sup>Abbreviations: I, industrial; PS, public supply.



TABLE 12  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## GENEVA COUNTY

| Well Number | Location                                             | Owner or name      | Driller            | Type of well | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                          |
|-------------|------------------------------------------------------|--------------------|--------------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|--------------------------------------------------|
| 1           | Samson                                               | Town well 2        | Deep Well Drilling | D            | 237                  | 8-6                      | 237                   | Gosport sand                                   | Drilled in 1947.                                 |
| 2           | Samson                                               | Town well 1        | Gray Artesian      | D            | 185                  | 6                        | ?                     | Gosport sand                                   | Perforated casing set in aquifer.                |
| 3           | Below city water tower                               | Coffee Springs     | Layne-Central      | D            | 291                  | 10-6                     | 288                   | Lisbon fm.                                     | Operating water level —153 ft. 40 ft. of screen. |
| 4           | At City Water Works                                  | Geneva             | Layne-Central      | D            | 200                  | 18-8                     |                       | Lisbon fm.                                     | Pump on base 15 ft. above land surface.          |
| 5           | 50 yds. W well 3                                     | Geneva             | Layne-Central      | D            | 452                  | 16-8                     | 452                   | Lisbon fm.                                     | Pumping level 195 ft.                            |
| 6           | Below tower at mill                                  | Geneva Cotton Mill |                    | D            | 350                  | 4½                       |                       | Lisbon fm.                                     | 180 ft. of 1¼-in. air line.                      |
| 7           | At swimming pool, NW¼, SW¼, sec. 27, T. 1 N, R. 22 E | Richard Lewis      |                    | D            | 1300                 | 8                        |                       | Nanafalia (?) fm.                              | Estimated yield 1,000 gpm.                       |
| 8           | Black                                                | Jr. High School    |                    | J            | 160                  | 4                        | 160                   | Gosport sand                                   | ½-HP cylinder pump.                              |
| 9           | Bellwood                                             | A. L. Bryan        | Stokes             | J            | 200                  | 4                        | 40                    | Lisbon fm.                                     | At rear of Bryan home.                           |
| 10          | ½ mi. S of well 9                                    | A. L. Bryan        | Geo. Hughes        | J            | 180                  | 2¾                       | 40                    | Lisbon fm.                                     | In A. L. Bryan pasture.                          |
| 11          | NE cor. of pumping plant                             | Hartford           | Gray Artesian      | D            | 322                  | 6                        | 322                   | Lisbon fm.                                     | Pumped about 14 hrs. per day.                    |
| 12          | 45 ft. NE of well 11                                 | Hartford           | Gray Artesian      | D            | 318                  | 6                        |                       | Lisbon fm.                                     |                                                  |
| 13          | Slocumb                                              | Town well          |                    | D            | 650                  | 8                        |                       | Tallahatta (?) fm.                             |                                                  |
| 14          | Malvern                                              | J. T. Edmonson     | L. Miller          | J            | 120                  | 2                        |                       | Residuum                                       | Meysers cylinder pump; 7 gpm.                    |
| 15          | Malvern                                              | Robert Hayes       | L. Miller          | J            | 90                   | 2                        | 90                    | Residuum                                       | Furnishes gas station and several houses.        |

<sup>1</sup>Abbreviations: D, drilled; J, jetted.

<sup>2</sup>Abbreviations: fm, formation.



TABLE 12—Continued

Analyses by G. A. Billingsley, R. H. Dellett, D. M. Parrish, and Merle E. Schroeder  
Parts per million

## GENEVA COUNTY

| Well data   |                                                   |                               |                | Chemical analyses |                           |                         |            |                              |                                 |                            |               |              |                            | Remarks |                                                         |
|-------------|---------------------------------------------------|-------------------------------|----------------|-------------------|---------------------------|-------------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|---------|---------------------------------------------------------|
| Well number | Water level                                       |                               | Yield (g.p.m.) |                   | Use of <sup>1</sup> water | Date of collec-<br>tion | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) |         | Total hardness                                          |
|             | Above +<br>or below—<br>land<br>surface<br>(feet) | Above<br>mean<br>sea<br>level | Flow           | Pump              |                           |                         |            |                              |                                 |                            |               |              |                            |         |                                                         |
| 1           | 205                                               | —60                           |                | 200               | PS                        | 6-29-48                 | 71         |                              | 117                             | 12                         | 4             | .0           | .3                         | 81      | Slight sulphur odor.<br><br>Supplies several<br>houses. |
| 2           | 204                                               | —60                           |                | 200               | PS                        | 7-17-46                 | 71         | 0                            | 120                             | 6                          | 1             | .1           | 1                          | 96      |                                                         |
| 3           | 272                                               | —92                           |                | 50                | PS                        | 7-25-46                 | 71         | 0                            | 166                             | 4                          | 2             | .0           | .0                         | 138     |                                                         |
| 4           | 101                                               | —20                           |                | 220               | PS                        | 3-21-46                 | 78         |                              | 205                             | 1                          | 5             | .0           | .1                         | 154     |                                                         |
| 5           | 101                                               | —20                           |                | 350               | PS                        | 3-24-47                 | 71         |                              | 220                             | 7                          | 22            | 0.2          | 0.2                        | 63      |                                                         |
| 6           | 105                                               | —24                           |                | 158               | I                         | 7-25-46                 | 71         | 0                            | 222                             | 12                         | 22            | .4           | .7                         | 27      |                                                         |
| 7           |                                                   | +20                           | 1,000          |                   | I                         | 3-21-46                 | 77         |                              | 228                             | 25                         | 252           | .5           | 1.2                        | 66      |                                                         |
| 8           |                                                   |                               |                |                   | PS                        | 7-25-46                 | 73         |                              | 11                              | 1                          | 4             | .0           | 3.0                        | 10      |                                                         |
| 9           | 124                                               | + 2.2                         | 3              |                   | D-S                       | 7-25-46                 | 68         | 0                            | 112                             | 8                          | 1             | .0           | .2                         | 87      |                                                         |
| 10          | 118                                               | + 8                           | 30             |                   | S                         | 7-25-46                 | 68         |                              |                                 |                            |               |              |                            |         |                                                         |
| 11          | 262                                               | —28                           |                | 250 ?             | PS                        | 7-25-46                 | 70         | 0                            | 17                              | 2                          | 22            | .0           | 15                         | 21      |                                                         |
| 12          | 259                                               | —37                           |                | 250               | PS                        |                         | 71         |                              |                                 |                            |               |              |                            |         |                                                         |
| 13          | 291                                               |                               |                | 200               | PS                        |                         | 69         |                              |                                 |                            |               |              |                            |         |                                                         |
| 14          | 271                                               | —10                           |                |                   | D-S                       | 7-25-46                 | 69         | 0                            | 12                              | 1                          | 2             | .0           | .0                         | 9       |                                                         |
| 15          | 286                                               | — 8.2                         |                | 6                 | D-S                       | 7-25-46                 | 69         |                              |                                 |                            |               |              |                            |         |                                                         |

Abbreviations: PS, public supply; I, industrial; D, domestic; S, stock.



TABLE 13  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## HENRY COUNTY

| Well Number | Location     | Owner or name | Driller       | Type of well | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                |
|-------------|--------------|---------------|---------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|----------------------------------------|
| 1           | Abbeville    | Town well 1   | Van Fleet     | D            | 401                  | 8                        | 401                   | Nanafalia fm.                                  | Drilled in 1904.                       |
| 2           | Abbeville    | Town well 2   | Layne-Central | D            | 480                  | 18-8                     | 480                   | Nanafalia (?) fm.                              | Drilled in 1930. Screen 334 to 480 ft. |
| 3           | Shorterville | M. L. Tillis  | B. H. Mills   | D            | 35                   | 2                        | 32                    | Sand of Jackson group                          | Drilled in 1928. Screen 32 to 35 ft.   |
| 4           | Headland     | Town well 1   |               | D            | 441                  | 4                        |                       | Tallahatta (?) fm.                             | Air-lift well.                         |
| 5           | Headland     | Town well 2   | Gray Artesian | D            | 250+                 | 10                       |                       | Lisbon fm.                                     | Drilled in 1928.                       |
| 6           | Headland     | Town well 3   | Layne-Central | D            | 663                  | 16-8                     | 659                   | Nanafalia fm.                                  | Drilled in 1946.                       |
| 7           | Newville     | Town well 1   |               | D            | 335                  | 8-6                      |                       | Lisbon fm.                                     | Drilled in 1926.                       |

<sup>1</sup>Abbreviations: D, drilled.

<sup>2</sup>Abbreviations: fm, formation.



TABLE 13—Continued

Analyses by W. T. Platt

Parts per million

HENRY COUNTY

| Well number | Well data                                  |                                      |                      |                | Chemical analyses |                           |                      |            |                              |                                 |                            |               |              |                            | Remarks |                   |
|-------------|--------------------------------------------|--------------------------------------|----------------------|----------------|-------------------|---------------------------|----------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|---------|-------------------|
|             | Elevation of ground above sea level (feet) | Water level                          |                      | Yield (g.p.m.) |                   | Use of <sup>1</sup> water | Date of collec- tion | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) |         | Total hardness    |
|             |                                            | Above + or below—land surface (feet) | Above mean sea level | Flow           | Pump              |                           |                      |            |                              |                                 |                            |               |              |                            |         |                   |
| 1           | 450                                        | —172                                 | 278                  | 125            | PS                | 7-10-46                   | 69                   |            | 227                          | 10                              | 5                          | 0             |              | .1                         | 198     | .6 ppm ppt. iron. |
| 2           | 450                                        | — 62                                 | 288                  | 300            | PS                | 7-10-46                   | 69                   |            | 2                            | 1                               | 7                          | 0             |              | 8.8                        | 9       | School supply.    |
| 3           |                                            | — 31                                 |                      | 7              | PS                | 7-10-46                   | 70                   |            | 116                          | 9                               | 4                          | 0             |              | .1                         | 96      | Reserve well.     |
| 4           |                                            |                                      |                      | 40             | PS                | 7-10-46                   | 68                   |            |                              |                                 |                            |               |              |                            |         |                   |
| 5           |                                            | — 80                                 |                      | 300            | PS                | 7-10-46                   | 69                   |            |                              |                                 |                            |               |              |                            |         |                   |
| 6           |                                            | —175                                 |                      | 250            | PS                | 7-10-46                   | 68                   |            |                              |                                 |                            |               |              |                            |         |                   |
| 7           |                                            | —135                                 |                      | 100            | PS                | 7-10-46                   | 69                   |            | 178                          | 10                              | 4                          | 0             |              | .1                         | 126     |                   |

<sup>1</sup>Abbreviations: PS, public supply.



TABLE 14  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## HOUSTON COUNTY

| Well Number | Location   | Owner or name | Driller        | Type of well | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                        |
|-------------|------------|---------------|----------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|------------------------------------------------|
| 1           | Dothan     | Town well 1   | S. S. Chandler | D            | 640                  | 8-6                      | 635                   | Nanafalia fm.                                  | Drilled in 1903. Air-lift well.                |
| 2           | Dothan     | Town well 2   | C. A. Ray      | D            | 625                  | 8-6                      | 625                   | Nanafalia fm.                                  | Drilled in 1896. Air-lift well.                |
| 3           | Dothan     | Town well 3   | Frank Sutter   | D            | 622                  | 8-6                      | 622                   | Nanafalia fm.                                  | Drilled in 1904. Air-lift well.                |
| 4           | Dothan     | Town well 4   | Gray Artesian  | D            | 315                  | 12                       | 313                   | Lisbon fm.                                     | Drilled in 1926. Electric turbine.             |
| 5           | Dothan     | Town well 5   | Gray Artesian  | D            | 332                  | 12                       |                       | Lisbon fm.                                     | Drilled in 1926. E. cor. of plant.             |
| 6           | Dothan     | Town well 6   | Gray Artesian  | D            | 326                  | 12                       | 326                   | Lisbon fm.                                     | Drilled in 1926. Pettus St. well.              |
| 7           | Dothan     | Town well 7   | Layne-Central  | D            | 329                  | 24-16                    | 329                   | Lisbon fm.                                     | Drilled in 1945. Washington St. well.          |
| 8           | Dothan     | Town well 7-A | Gray Artesian  | D            | 295                  | 24-22                    | 295                   | Lisbon fm.                                     | Drilled in 1943. Abandoned.                    |
| 9           | Dothan     | Town well 8   | Layne-Central  | D            | 684                  | 18-8                     | 684                   | Nanafalia fm.                                  | Drilled in 1945. East St. well.                |
| 10          | Dothan     | Town well 10  | Layne-Central  | D            | 835                  | 18-8                     | 790                   | Nanafalia fm.                                  | Drilled in 1946. Powell St. well.              |
| 11          | Dothan     | W. H. Malone  | L. C. Gray     | D            | 230                  | 4                        | 230                   | Gosport sand                                   | Drilled in 1946. Sec. 21, T. 3 N, R. 26 E.     |
| 12          | Webb       | School well   |                | D            | 96                   | 3                        | 91                    | Gosport sand                                   | Screen 91 to 96 ft.                            |
| 13          | Columbia   | Town well 1   | Law Bros.      | D            | 437                  | 8-6                      | 250                   | Nanafalia fm.                                  |                                                |
| 14          | Ashford    | Town well 1   | Gray Artesian  | D            | 202                  | 10-8                     | 202                   | Gosport sand                                   | Drilled in 1928.                               |
| 15          | Ashford    | Town well 2   | Layne-Central  | D            | 115                  | 18-8                     | 115                   | Gosport sand                                   | Drilled in 1937.                               |
| 16          | Cowartz    | L. L. Donzy   | Smith          | D            | 94                   | 2                        | 90                    | Gosport sand                                   | Drilled in 1944. Screen 90 to 94 ft.           |
| 17          | Cottonwood | Town well 1   | Gray Artesian  | D            | 300                  | 6                        | 300                   | Lisbon fm.                                     | Drilled in 1912.                               |
| 18          | Cottonwood | Town well 2   | F. M. Greene   | D            | 185                  | 6-4                      | 185                   | Gosport (?) sand                               | Drilled in 1942.                               |
| 19          | Cottonwood | J. R. Sealy   |                | D            | 4,280                | 6                        | 4,280                 | Eutaw (?) fm.                                  | Drilled in 1927. Combined well (inner casing). |
| 20          | Cottonwood | J. R. Sealy   |                | D            | 1,120                | 14                       | 1,120                 | Nanafalia fm.                                  | Same well (outer casing).                      |

<sup>1</sup>Abbreviations: D, drilled.<sup>2</sup>Abbreviations: fm, formation.



TABLE 14—Continued

Analyses by Neill K. McShane  
Parts per million

## HOUSTON COUNTY

| Well data   |                                            |                                      |                      |      | Chemical analyses |                    |            |                              |                                 |                            |               |              |                            |                | Remarks                                                               |
|-------------|--------------------------------------------|--------------------------------------|----------------------|------|-------------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|-----------------------------------------------------------------------|
| Well number | Water level                                |                                      | Yield (g.p.m.)       |      | Use of water      | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |                                                                       |
|             | Elevation of ground above sea level (feet) | Above + or below—land surface (feet) | Above mean sea level | Pump |                   |                    |            |                              |                                 |                            |               |              |                            |                |                                                                       |
| 1           | 323                                        | —150                                 |                      | 250  | PS                | 3-12-46            | 73         |                              | 176                             | 10                         | 8             | .1           | 0.1                        | 100            | 1.1 ppm iron (in ppt.)<br>Supplies 8 houses.<br><br>Milky appearance. |
| 2           | 323                                        | —150                                 |                      | 250  | PS                | 3-12-46            | 73         |                              |                                 |                            |               |              |                            |                |                                                                       |
| 3           | 311                                        | —141                                 |                      | 250  | PS                | 3-13-46            | 73         |                              |                                 |                            |               |              |                            |                |                                                                       |
| 4           | 313                                        | —29                                  |                      | 180  | PS                | 3-12-46            | 69         |                              |                                 |                            |               |              |                            |                |                                                                       |
| 5           | 314                                        | —41                                  |                      | 200  | PS                | 3-12-46            | 69         | 6                            |                                 | 1                          | 22            | .0           | 9.2                        | 16             |                                                                       |
| 6           | 286                                        | —51                                  |                      | 220  | PS                | 3-11-46            | 70         |                              |                                 |                            |               |              |                            |                |                                                                       |
| 7           | 298                                        | —53                                  |                      | 620  | PS                | 3-12-46            | 69         |                              |                                 |                            |               |              |                            |                |                                                                       |
| 8           | 298                                        | —48                                  |                      |      | PS                | 3-11-46            |            |                              |                                 |                            |               |              |                            |                |                                                                       |
| 9           | 313                                        | —145                                 |                      | 480  | PS                | 3-12-46            | 74         |                              |                                 |                            |               |              |                            |                |                                                                       |
| 10          | 318                                        | —157                                 |                      | 555  | PS                |                    |            |                              |                                 |                            |               |              |                            |                |                                                                       |
| 11          | 307                                        | —40                                  |                      | 70   | D                 | 3-22-46            |            |                              |                                 |                            |               |              |                            |                |                                                                       |
| 12          | 300                                        | —40                                  |                      | 7    | PS                | 3-20-46            |            |                              | 36                              | 1                          | 5             | .0           | 1.0                        | 34             |                                                                       |
| 13          | 135                                        |                                      |                      | 175  | PS                | 3-20-46            | 76         |                              | 186                             | 10                         | 7.5           | .1           | .1                         | 135            |                                                                       |
| 14          | 247                                        | —22                                  |                      | 100  | PS                | 3-22-46            | 71         |                              | 56                              | 1                          | 17            | .0           | 4.0                        | 76             |                                                                       |
| 15          | 248                                        | —28                                  |                      | 250  | PS                | 3-22-46            | 71         |                              | 121                             | 1                          | 7             | .1           | 4.4                        | 102            |                                                                       |
| 16          |                                            | —30                                  |                      | 9    | D                 | 3-21-46            | 68         |                              | 24                              | 1                          | 8.5           | .1           | 8.5                        | 18             |                                                                       |
| 17          |                                            | —42                                  |                      | 50   | PS                | 3-20-46            | 70         |                              | 124                             | 5                          | 6.5           | .0           | 3.0                        | 106            |                                                                       |
| 18          |                                            | —12                                  |                      |      | PS                | 3-20-46            | 70         |                              | 120                             | 1                          | 4.5           | .0           | 1.6                        | 99             |                                                                       |
| 19          |                                            |                                      |                      |      | I                 | 3-20-46            | 112        |                              | 269                             | 1                          | 9,400         | .3           | 1                          | 795            |                                                                       |
| 20          |                                            |                                      |                      |      | PS                | 3-20-46            | 79         |                              | 178                             | 8                          | 5.5           | .1           | .1                         | 135            |                                                                       |

<sup>1</sup>Abbreviations: D, domestic; PS, public supply; I, industrial.



TABLE 15  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## MARENGO COUNTY

| Well Number | Location                                    | Owner or name          | Driller           | Type of Well | Depth of Well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                                         |
|-------------|---------------------------------------------|------------------------|-------------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|-----------------------------------------------------------------|
| 1           | Linden                                      | Town well 1            | Gray Artesian     | D            | 1,247                | 6                        | 1,165                 | Eutaw fm.                                      | Drilled in 1925. 80 ft. of 6-in. screen.                        |
| 2           | Linden                                      | Town well 2            | Va. Machinery Co. | D            | 1,080                | 10                       | 1,080                 | Eutaw fm.                                      | Drilled in 1929. 32 ft. of screen.                              |
| 3           | Linden                                      | Town well 3            | Layne-Central     | D            | 1,107                | 12-6                     | 1,107                 | Eutaw fm.                                      | Drilled in 1948.                                                |
| 4           | N side of Linden on US 43                   | C. L. Mayton           | Deep-Well Drill.  | Dug          | 20                   | 36                       |                       | Ripley fm.                                     |                                                                 |
| 5           | SW side of Linden                           | Linden Ice Plant       |                   | D            | 191                  | 10-4                     | 191                   |                                                | 20 ft. screen.                                                  |
| 6           | 2 blocks E of Linden court-house on Ala. 28 | E. T. Norman           |                   | Dug          | 29                   | 36                       |                       | Ripley fm.                                     |                                                                 |
| 7           | Linden                                      | W. T. Smith Lbr. Co.   | Layne-Central     | D            | 87                   | 6                        | 87                    | Ripley fm.                                     | Drilled in Dec. 1943. 30 ft. of screen.                         |
| 8           | Thomaston                                   | Town well              | Johannson         | D            | 1,220                | 6-4                      |                       | Eutaw fm.                                      | Drilled in 1904.                                                |
| 9           | Thomaston                                   | C. J. Stallworth       |                   | Dug          | 25                   | 36                       |                       | Ripley fm.                                     |                                                                 |
| 10          | 100 yds. N of postoffice at Magnolia        | C. W. Agee             | Penn. Drill. Co.  | D            | 646                  | 6-4                      | 570                   | Ripley fm.                                     | Drilled in 1946.                                                |
| 11          | 25 yds. W of school                         | Dixons Mills           |                   | Dug          | 38                   | 48                       | 38                    | Tuscahoma sand                                 | School supply, uses 1,000 g.p.d.                                |
| 12          | 50 yds. W of school                         | Sweetwater High School | Bob Harmon        | D            | 110                  | 3                        | 20                    | Nanafalia fm.                                  | Drilled in 1926.                                                |
| 13          | 40 yds. W-SW of school                      | Sweetwater High School | Merry Bros.       | D            | 147                  | 6                        | 133                   | Nanafalia fm.                                  | Drilled in May 1946.                                            |
| 14          | Near ponds at Lumber Co., Nanafalia         | Tutt Lbr. Co. No. 1    | Merry Bros.       | D            | 330                  | 6                        | 212                   | Nanafalia fm.                                  | Drilled in May 1946. Lumber Co. has two wells. Supplies school. |
| 15          | Nanafalia                                   | M. T. Pritchett        | Pritchett         | Dug          | 39                   | 36                       | 36                    | Tuscahoma sand                                 |                                                                 |
| 16          | Nanafalia                                   | Nanafalia School       | Merry Bros.       | D            |                      |                          |                       | Nanafalia fm.                                  |                                                                 |

<sup>1</sup>Abbreviations: D, drilled.

<sup>2</sup>Abbreviations: fm, formation.



TABLE 15—Continued  
Analyses by G. A. Billingsley, R. H. Dellett, T. B. Dover, Margaret D. Foster, D. M. Parrish, and Neill K. McShane  
Parts per million

## MARENGO COUNTY

| Well data   |                                            |                                      |                      |                |      |              |                    |            |                              | Chemical analyses               |                            |               |              |                            |                | Remarks                                             |
|-------------|--------------------------------------------|--------------------------------------|----------------------|----------------|------|--------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|-----------------------------------------------------|
| Well number | Water level                                |                                      |                      | Yield (g.p.m.) |      | Use of water | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |                                                     |
|             | Elevation of ground above sea level (feet) | Above + or below—land surface (feet) | Above mean sea level | Flow           | Pump |              |                    |            |                              |                                 |                            |               |              |                            |                |                                                     |
| 1           | 149                                        |                                      |                      | 40             |      | PS           | 3-24-47            | 60.8       |                              | 638                             | Trace                      | 628           | 2.6          | 2.9                        | 63             | Chloride 690, F 3.2, when analyzed 1-22-42.         |
| 2           | 154                                        |                                      |                      |                | 80   | PS           | 1-22-42            |            |                              | 688                             | 1                          | 530           | 3.2          |                            | 18             | 30 ft. drawdown after pumping 8 hrs. at 80 gpm.     |
| 3           |                                            |                                      |                      |                |      |              |                    |            |                              |                                 |                            |               |              |                            |                |                                                     |
| 4           |                                            |                                      |                      |                | 3±   | D            | 1-22-42            |            |                              | 65                              | 6                          | 13            | .3           | 8.9                        | 74             |                                                     |
| 5           |                                            |                                      |                      |                | 35   | I            | 12- 8-47           | 66.5       |                              | 358                             | 25                         | 20            |              | 0.2                        | 122            |                                                     |
| 6           |                                            | -18                                  |                      |                | 3±   | D            | 1-22-42            |            |                              | 182                             | 10                         | 27            | .4           | 1.9                        | 178            |                                                     |
| 7           |                                            | -24                                  |                      |                | 40   |              |                    |            |                              |                                 |                            |               |              |                            |                | 30 ft. drawdown after pumping 8 hrs. at 50 gpm.     |
| 8           |                                            |                                      |                      |                | 7    | PS           | 1-22-42            |            |                              | 496                             | 1                          | 580           | 3.2          |                            | 42             | Town supplied with water from two or three faucets. |
| 9           |                                            | -20                                  |                      |                | 5±   | D            | 1-22-42            |            |                              | 6                               | 4                          | 34            | .1           | 33                         | 57             |                                                     |
| 10          | 281                                        | -98                                  |                      |                | 12   | D-S          | 10-23-46           |            |                              | 284                             | 1                          | 1,470         | 3.4          |                            | 165            |                                                     |
| 11          |                                            | -35                                  |                      |                | 7    | PS           | 2-28-46            | 60         |                              | 10                              | 1                          | 5             | .0           | 6                          | 18             |                                                     |
| 12          | 203±                                       | -28                                  | 175                  |                | 4    | PS           | 2-28-46            |            |                              | 350                             | 35                         | 10            | .1           | 1.6                        | 93             | Aneroid elevation. Long run.                        |
| 13          | 200±                                       | -25                                  | * 175                |                | 30   | PS           | 2-28-46            | 60         |                              |                                 |                            |               |              |                            |                |                                                     |
| 14          | 225                                        | -95                                  | 130                  |                | 20   | I            | 5-13-48            | 68         |                              | 271                             | 20                         | 7.0           | .0           | 1.2                        | 155            |                                                     |
| 15          | 225                                        | -33                                  |                      |                | 9    | PS           | 2-28-46            | 62         |                              | 6                               | 1                          | 7.5           | .0           | 3.7                        | 7.5            |                                                     |
| 16          | 225                                        |                                      |                      |                |      |              |                    |            |                              |                                 |                            |               |              |                            |                |                                                     |

<sup>1</sup>Abbreviations: PS, public supply; D, domestic; S, stock; I, industrial.



TABLE 16  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## MOBILE COUNTY

| Well Number | Location             | Owner or name        | Driller              | Type of Well <sup>1</sup> | Depth of Well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                                           |
|-------------|----------------------|----------------------|----------------------|---------------------------|----------------------|--------------------------|-----------------------|------------------------------------------------|-------------------------------------------------------------------|
| 1           | Calvert              | Public school        |                      | D                         | 55                   | 2                        |                       | Miocene sands                                  |                                                                   |
| 2           | 0.5 mi. S of Calvert | Public school        |                      | J                         | 17                   | 3                        |                       | Miocene sands<br>Citronelle fm.                | Bottled. Sold commercially for mineral water.<br>Drilled in 1935. |
| 3           | Citronelle           |                      |                      |                           |                      |                          |                       |                                                |                                                                   |
| 4           | Citronelle           | B. M. Childers       | Layne-Central        | D                         | 113                  | 16                       |                       | Citronelle fm.                                 |                                                                   |
| 5           | Mt. Vernon           | Public school        |                      | Dr                        | 20                   | 2                        |                       | Miocene (?) sands                              |                                                                   |
| 6           | Mt. Vernon           | Public school        | B. Haselmire         | D                         | 75                   | 2                        |                       | Miocene sands                                  | Drilled in 1936.                                                  |
| 7           | Satsuma              | Public school        |                      | D                         | 68                   | 2                        |                       | Alluvium (?)                                   |                                                                   |
| 8           | Mobile               | First Natl. Bank     | Carlross Well Supply | D                         | 717                  | 10                       |                       | Miocene sands                                  | Used for air conditioning.                                        |
| 9           | Mobile               | Merchants Natl. Bank | Gulf Coast Well Co.  | D                         |                      |                          |                       |                                                |                                                                   |
| 10          | Mobile               | Fulton Ice Co.       | Gray Artesian Co.    | D                         | 75                   | 8                        |                       | Alluvium                                       | Used for air conditioning.                                        |
| 11          | Mobile               | Crystal Ice Co.      | Gray Artesian Co.    | D                         | 270                  | 18                       |                       | Miocene sands                                  | Used for the manufacture of ice.                                  |
| 12          | Mobile               | Oakdale Ice Co.      | Gulf Coast Well Co.  | D                         | 85                   | 4                        |                       | Alluvium                                       | Used for the manufacture of ice.                                  |
| 13          | Theodore             | Public school        |                      | D                         | 87                   | 6                        |                       | Alluvium                                       | Used for the manufacture of ice.                                  |
| 14          | Grand Bay            | Public school        |                      | Dr                        | 37                   | 1                        |                       | Citronelle fm.                                 |                                                                   |
| 15          | Bayou LaBatre        | Gussie Bosarge       |                      | D                         | 65                   | 3                        |                       | Citronelle fm.                                 |                                                                   |
| 16          | Bayou LaBatre        | Gussie Bosarge       | Deep Well Drill.     | D                         | 580                  | 3½                       |                       | Miocene sands                                  |                                                                   |
|             |                      |                      |                      | D                         | 461                  | 4                        |                       | Miocene sands                                  | Drilled in 1946.                                                  |

<sup>1</sup>Abbreviations: D, drilled; Dr, driven; J, jetted.

<sup>2</sup>Abbreviations: fm, formation.



TABLE 16.—Continued

Analyses by R. H. Delleit, Evelyn Holloman, V. T. McNamara, and Merle E. Schroeder  
Parts per million

## MOBILE COUNTY

| Well number | Well data                          |                      |                |      | Chemical analyses |                    |            |                              |                                 |                            |               |              |                            |                | Remarks |
|-------------|------------------------------------|----------------------|----------------|------|-------------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|---------|
|             | Water level                        |                      | Yield (g.p.m.) |      | Use of water      | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |         |
|             | Above or below land surface (feet) | Above mean sea level | Flow           | Pump |                   |                    |            |                              |                                 |                            |               |              |                            |                |         |
| 1           | 50 ±                               | -20                  | 30             | 5    | PS                | 9-21-46            | 71         |                              | 90                              | 1                          | 5             | 0            | 0.2                        | 12             |         |
| 2           | 50                                 | -2.5                 | 47.5           | 5    | PS                | 7-10-46            | 80         | 0                            | 57                              | 13                         | 10            | 0            | 7.7                        | 70             |         |
| 3           | 210 ±                              | + 2                  | 212            |      | C                 | 7-12-46            | 67         | 0                            | 19                              | 1                          | 1             | 0            | 0                          | 10             |         |
| 4           | 310                                | -65                  | 245            | 125  | PS                | 8-16-45            | 75         |                              | 6                               | 1                          | 7             | 0            | 4.5                        | 10             |         |
| 5           | 40                                 | -13                  | 27             |      | PS                | 7-13-46            | 80         | 0                            | 48                              | 1                          | 4             | 0            | 0                          | 8              |         |
| 6           | 40                                 | -19                  | 21             |      | PS                | 9-21-46            | 72         |                              | 19                              | 1                          | 6             | 0            | 0.6                        | 24             |         |
| 7           | 20                                 | - 2                  | +18            | 5    | PS                | 9-21-46            | 71         |                              | 10                              | 7                          | 3             | 0            | 2.1                        | 14             |         |
| 8           | 11                                 |                      |                | 800  | I                 | 9-15-45            | 75         |                              | 444                             | 3                          | 1,060         |              |                            | 39             |         |
| 9           | 11                                 |                      |                | 500  | I                 | 9-17-45            | 71.5       |                              | 92                              | 473                        | 3,880         | 0.1          | 16                         | 1,440          |         |
| 10          | 30                                 | -33                  | - 3            | 500  | C                 | 9-17-45            | 70.0       |                              | 5                               | 6                          | 8             | 0.1          | 0.1                        | 12             |         |
| 11          | 15                                 | -20                  | - 5            | 165  | C                 | 9-15-45            | 70.5       |                              | 3                               | 53                         | 29            | 0.2          | 30                         | 58             |         |
| 12          | 15                                 | -14                  | + 1            | 250  | C                 | 9-15-45            | 74.0       |                              | 4                               | 11                         | 13            | 0.1          | 10                         | 18             |         |
| 13          | 65                                 | -10                  | 55             |      | PS                | 9-21-46            | 71         |                              | 5                               | 1                          | 5             | 0            | 2.9                        | 9              |         |
| 14          | 80                                 | -55                  | 25             | 4    | PS                | 9-21-46            | 70         |                              | 4                               | 3                          | 8             | 0            | 3.2                        | 12             |         |
| 15          | 5                                  | +21                  | 26             |      | PS                | 9-21-46            | 69         |                              | 46                              | 8                          | 32            | 0            | 0.1                        | 15             |         |
| 16          | 10                                 | +22                  | 32             | 30   | PS                | 1-16-47            | 69         |                              |                                 |                            |               |              |                            |                |         |

<sup>1</sup>Abbreviations: PS, public supply; I, industrial; C, commercial.



TABLE 17  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## MONROE COUNTY

| Well Number | Location    | Owner or name           | Driller           | Type of Well <sup>1</sup> | Depth of Well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                    |
|-------------|-------------|-------------------------|-------------------|---------------------------|----------------------|--------------------------|-----------------------|------------------------------------------------|--------------------------------------------|
| 1           | Vredenburgh | S. H. Vredenburgh       | Gray Artesian Co. | D                         | 320                  | 10                       | 85                    | Nanafalia fm.                                  | Drilled in 1912.                           |
| 2           | Vredenburgh | W. E. Shannon           | Deep Well Drill.  | D                         | 336                  | 4                        | 326                   | Nanafalia fm.                                  | Drilled in 1946. Screen 311 to 326 ft.     |
| 3           | Vredenburgh | S. H. Vredenburgh       | Layne-Central     | D                         | 274                  | 12                       | 274                   | Nanafalia fm.                                  | Drilled Jan. 8, 1948.                      |
| 4           | Buena Vista | O. B. Finklea           | J. R. Bridges     | J                         | 400                  | 4                        |                       | Nanafalia fm.                                  | Drilled in 1940. Other wells in area flow. |
| 5           | Beatrice    | High School             |                   | D                         | 65                   | 4                        | 50                    | Tuscahoma sand                                 | Screen 50 to 65 ft.                        |
| 6           | Peterman    | P. S. Jackson           | J. F. Robinson    | D                         | 365                  | 4                        | 32                    | Tallahatta (?) fm.                             | Supplies 12 to 15 families.                |
| 7           | Peterman    | P. S. Jackson           | Ed. Kearley       | D                         | 235                  | 4                        | 36                    | Tallahatta (?) fm.                             |                                            |
| 8           | Monroeville | Town well 1             | Gray Artesian Co. | D                         | 90                   | 12                       | 90                    | Ocala ls.                                      | Drilled in 1925.                           |
| 9           | Monroeville | W. L. Chappell Lbr. Co. | Deep Well Drill.  | D                         | 96                   | 4                        |                       | Ocala ls.                                      | Drilled in 1946.                           |
| 10          | Monroeville | Gulf Utilities          | Gray Artesian     | D                         | 116                  |                          | 80                    | Ocala ls.                                      | Drilled in 1928. 32 ft. of screen.         |
| 11          | Monroeville | Town well 2             | Gray Artesian     | D                         | 158                  | 12                       | 76                    | Ocala ls.                                      | Drilled in 1948.                           |
| 12          | Frisco City | Town well               | Gray Artesian     | D                         | 124                  | 20-10                    |                       |                                                | Drilled in 1935. 38 ft. of screen.         |
| 13          | Excel       | Excel School            | B. B. Booker      | J                         | 35                   | 2                        | 31                    | Citronelle fm.                                 | Screen 31 to 35 ft.                        |
| 14          | Uriah       | Uriah School            | B. B. Booker      | J                         | 80                   | 3                        |                       | Citronelle fm.                                 | 1/2 HP cylinder pump.                      |
| 15          | Uriah       | Woodrow Gross           | B. B. Booker      | J                         | 76                   | 2                        | 72                    | Citronelle fm.                                 | Drilled in 1946. Screen 72 to 76 ft.       |
| 16          | Uriah       | Bruce Gulsby            | B. B. Booker      | J                         |                      |                          |                       |                                                |                                            |

<sup>1</sup>Abbreviations: J, jetted; D, drilled.

<sup>2</sup>Abbreviations: fm, formation; ls, limestone.



TABLE 17—Continued

Analyses by W. T. Platt  
Parts per million

## MONROE COUNTY

| Well number | Well data                                         |                               |                |      |     | Chemical analyses         |                         |            |                              |                                 |                            |               |              |                            |                | Remarks                                           |
|-------------|---------------------------------------------------|-------------------------------|----------------|------|-----|---------------------------|-------------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|---------------------------------------------------|
|             | Water level                                       |                               | Yield (g.p.m.) |      |     | Use of <sup>1</sup> water | Date of collec-<br>tion | Temp. o F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |                                                   |
|             | Above +<br>or below—<br>land<br>surface<br>(feet) | Above<br>mean<br>sea<br>level | Flow           | Pump |     |                           |                         |            |                              |                                 |                            |               |              |                            |                |                                                   |
| 1           | —                                                 | 38                            |                |      | 150 | PS                        | 5-28-46                 | 72         | 9.8                          | 338                             | 5                          | 45            | .3           | .4                         | 16             |                                                   |
| 2           | —                                                 | 18                            |                |      |     | D                         | 5-46                    |            |                              |                                 |                            |               |              |                            |                |                                                   |
| 3           | —                                                 | 46                            |                |      | 200 | PS                        | 3- 4-48                 | 72         |                              |                                 |                            |               |              |                            |                |                                                   |
| 4           | —                                                 | 12                            |                |      | 12  | D-S-I                     | 5-28-46                 |            |                              |                                 |                            |               |              |                            |                |                                                   |
| 5           | 273                                               | 45                            |                |      | 3   | PS                        | 5-28-46                 | 68         |                              | 7                               | 3                          | 3             | .0           | 4                          | 6              |                                                   |
| 6           | 238                                               | 78                            |                |      | 12  | PS                        | 5-28-46                 | 68         |                              | 168                             | 15                         | 3             | .1           | .8                         | 42             |                                                   |
| 7           | 240                                               | 155                           |                |      | 9   | PS                        | 5-28-46                 | 68         |                              |                                 |                            |               |              |                            |                |                                                   |
| 8           | 427                                               | 57                            |                |      | 250 | PS                        | 5-28-46                 | 68         |                              | 130                             | 1                          | 4             | .0           | 7.2                        | 99             |                                                   |
| 9           | 423                                               | 52                            |                |      |     | I                         | 5-28-46                 | 68         |                              |                                 |                            |               |              |                            |                |                                                   |
| 10          |                                                   | 58                            |                |      | 40  | I                         |                         |            |                              |                                 |                            |               |              |                            |                |                                                   |
| 11          | 420+                                              | 65                            | 355            |      | 385 | PS                        | 7- 1-48                 | 68         |                              | 4                               | 6                          | 6.3           | .0           | 7.6                        | 11             | Drawdown 5 ft. at 100<br>gpm.<br>Slight sediment. |
| 12          | 386                                               | 66                            | 320            |      | 100 | PS                        | 5-28-46                 | 68         |                              | 3                               | 4                          | 6             | .0           | 3                          | 9              |                                                   |
| 13          |                                                   | 30                            |                |      | 6   | PS                        | 5-28-46                 | 65         |                              | 5                               | 2                          | 6             | .1           | 5.5                        | 15             |                                                   |
| 14          | 137                                               | 62                            |                |      | 6   | PS                        | 5-28-46                 | 69         |                              |                                 |                            |               |              |                            |                |                                                   |
| 15          | 139                                               | 64                            |                |      | 12  | D                         | 5-28-46                 | 69         |                              |                                 |                            |               |              |                            |                |                                                   |
| 16          | 139                                               | 64                            |                |      | 10  | D                         | 5-28-46                 | 69         |                              | 28                              | 1                          | 6             | .0           | 6.3                        | 20             |                                                   |

<sup>1</sup>Abbreviations: PS, public supply; D, domestic; S, stock; I, industrial.



TABLE 18  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## PIKE COUNTY

| Well Number | Location  | Owner or name | Driller        | Type of well <sup>1</sup> | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                                                      |
|-------------|-----------|---------------|----------------|---------------------------|----------------------|--------------------------|-----------------------|------------------------------------------------|------------------------------------------------------------------------------|
| 1           | Troy      | Town well 5   | Layne-Central  | D                         | 519                  | 10                       | 519                   | Ripley and Cusseta fms.                        | Drilled in 1945. Log available.                                              |
| 2           | Goshen    | Town well     | Powell         | D                         | 243                  | 4                        | 60                    | Providence sand                                | Drilled in 1941.                                                             |
| 3           | Brundidge | Town well 1   | Gray Artesian  | D                         | 256                  | 8                        | 139                   | Providence sand                                | Drilled in 1919.                                                             |
| 4           | Brundidge | Town well 2   | Gray Artesian  | D                         | 250                  | 8                        | 220                   | Providence (?) sand                            | Drilled 1941. Sand 220 to 250 ft.                                            |
| 4-A         | Brundidge | Town well 3   | Layne-Central  | D                         | 632                  | 16-8                     | 632                   | Ripley and Cusseta fms.                        | Drilled in 1948.                                                             |
| 5           | Banks     | Shanks well   | Peerson Drill. | D                         | 466                  | 4                        | 455                   | Providence sand                                | Drilled in 1947.                                                             |
| 6           | Troy      | Town well 2   | White          | D                         | 280                  | 8                        | 280                   | Ripley and Cusseta fms.                        | Drilled in 1914. Abandoned.                                                  |
| 7           | Troy      | Town well 3   | White          | D                         | 280                  | 8                        | 280                   | Ripley and Cusseta fms.                        | Drilled in 1914. Abandoned.                                                  |
| 8           | Troy      | Town well 4   | Layne-Central  | D                         | 237                  | 30-12                    | 237                   | Ripley and Cusseta fms.                        | Drilled in 1940. Log available. In Cretaceous area; included for comparison. |

<sup>1</sup>Abbreviations: D, drilled.<sup>2</sup>Abbreviations: fm, formation.



TABLE 18.—Continued

Analyses by V. T. McNamara, L. W. Miller, and M. D. Foster  
Parts per million

## PIKE COUNTY

| Well data   |                                      |                      |                |      |              |                    |            |                              |                                 | Chemical analyses          |               |              |                            |                |                 |
|-------------|--------------------------------------|----------------------|----------------|------|--------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|-----------------|
| Well number | Water level                          |                      | Yield (g.p.m.) |      | Use of water | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness | Remarks         |
|             | Above + or below—land surface (feet) | Above mean sea level | Flow           | Pump |              |                    |            |                              |                                 |                            |               |              |                            |                |                 |
| 1           | 534                                  | —280                 | 254            | 700  | PS           | 10-2-45            | 70         |                              | 196                             | 6                          | 3             | .1           | 1.2                        | 56             | Same as well 8. |
| 2           | 324                                  |                      |                | 6    | PS           | 10-2-45            | 69         |                              | 107                             | 2                          | 7             | .0           | .25                        | 108            |                 |
| 3           | 465                                  | —20                  | 445            | 250  | PS           | 10-5-45            | 62         |                              | 181                             | 15                         | 6             | .0           | 3.4                        | 138            |                 |
| 4           | 466                                  | —21                  | 445            | 175  | PS           | 10-5-45            | 62         |                              |                                 |                            |               |              |                            |                |                 |
| 4-A         | 479                                  |                      |                |      | PS           | 9-22-48            |            |                              |                                 |                            |               |              |                            |                |                 |
| 5           |                                      | —180                 |                | 15   | D            |                    |            |                              |                                 |                            |               |              |                            |                |                 |
| 6           | 320 ±                                | —70                  | 250            | 150  | PS           | 11-15-40           | 65         |                              |                                 |                            |               |              |                            |                |                 |
| 7           | 320 ±                                | —70                  | 250            | 150  | PS           | 11-15-40           | 65         |                              | 213                             | 8                          | 3             | .0           | .0                         | 24             |                 |
| 8           | 320 ±                                | —70                  | 250            | 720  | PS           | 11-15-40           | 65.5       |                              | 204                             | 11                         | 3.8           | .0           | 1.0                        | 44             |                 |

<sup>1</sup>Abbreviations: PS, public supply; D, domestic.



TABLE 19  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## WASHINGTON COUNTY

| Well Number | Location     | Owner or name          | Driller          | Type of Well <sup>1</sup> | Depth of Well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                    |
|-------------|--------------|------------------------|------------------|---------------------------|----------------------|--------------------------|-----------------------|------------------------------------------------|--------------------------------------------|
| 1           | Millry       | High School 1          | Gus Downey       | J                         | 199                  | 3                        |                       | Miocene sands                                  | Pumped for use in school showers.          |
| 2           | Millry       | High School 2          |                  | D                         | 144                  | 4                        | 65                    | Miocene sands                                  | Drilled in 1946.                           |
| 3           | Millry       | J. G. Kimbrough, Store | Elis Harmon      | D                         | 85                   | 6                        | 22                    | Miocene sands                                  | Most of town uses water from this aquifer. |
| 4           | Chatom       | John B. Richardson     | Gulf Coast Well  | D                         | 175                  | 6-4                      | 3                     | Miocene sands                                  | Wells at Richardson iceplant.              |
| 5           | Chatom       | John B. Richardson     | Gulf Coast Well  | D                         | 384                  | 6-4                      | 364                   | Miocene sands                                  | Screen 364 to 384 ft.                      |
| 6           | Chatom       | High School 1          | Harry Hostettler | D                         | 246                  | 3                        | 240                   | Miocene sands                                  | Drilled in 1946.                           |
| 7           | Chatom       | High School 2          | Harry Hostettler | D                         | 241                  | 6                        | 214                   | Miocene sands                                  | Drilled in 1941.                           |
| 8           | Tibbie       | W. W. Kirkland         | Owen Avant       | D                         | 256                  | 2                        | 244                   | Miocene sands                                  | Drilled in 1934. Screen 244 to 256 ft.     |
| 9           | Deer Park    | Jr. High School        |                  | D                         | 147                  | 4-2                      | 147                   | Miocene sands                                  | Drilled in 1945.                           |
| 10          | Wagarville   | Jr. High School        | Drew Parson      | J                         | 65                   | 3                        | 60                    | Miocene sands                                  | Screen 60 to 65 ft.                        |
| 11          | Leroy        | High School            |                  | Dug                       | 28                   |                          |                       | Miocene (?) sands                              | Well diameter 9 x 13 ft.                   |
| 12          | St. Stephens | High School            | Harry Hostettler | D                         | 290                  | 4                        |                       | Miocene sands                                  | Well drilled in 1946.                      |
| 13          | Chatom       | J. B. Richardson       | Gray Artesian    | D                         |                      |                          |                       |                                                | Under construction at present.             |

<sup>1</sup>Abbreviations: D, drilled; J, jetted.

<sup>2</sup>Abbreviations: fm, formation.



TABLE 19—Continued  
Analyses by R. H. Dellett  
Parts per million  
WASHINGTON COUNTY

WASHINGTON COUNTY

Chemical analyses

Well data

| Well number | Water level                                |                                      |                      | Yield (g.p.m.) | Pump | Use of <sup>1</sup> water | Date of collec-<br>tion | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness | Remarks                                                                                              |
|-------------|--------------------------------------------|--------------------------------------|----------------------|----------------|------|---------------------------|-------------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|------------------------------------------------------------------------------------------------------|
|             | Elevation of ground above sea level (feet) | Above + or below—land surface (feet) | Above mean sea level |                |      |                           |                         |            |                              |                                 |                            |               |              |                            |                |                                                                                                      |
|             |                                            |                                      |                      |                |      |                           |                         |            |                              |                                 |                            |               |              |                            |                |                                                                                                      |
| 1           |                                            | + 4±                                 |                      | 5              | 7    | PS                        | 10-4-46                 | 69         |                              | 186                             | 13                         | 4             | .0           | .2                         | 152            | 5.2 ppm iron (in ppt.)                                                                               |
| 2           |                                            | — 18                                 |                      |                |      | PS                        | 10-4-46                 | 69         |                              | 126                             | 5                          | 1             | .0           | .1                         | 90             |                                                                                                      |
| 3           |                                            | + 2                                  |                      | 2              |      | D                         | 10-4-46                 | 69         |                              | 26                              | 11                         | 7             | .1           | .1                         | 27             |                                                                                                      |
| 4           | 170                                        | — 25                                 | 145                  |                |      | PS, I                     | 10-4-46                 | 69         |                              | 188                             | 6                          | 5             | .2           | .1                         | 81             |                                                                                                      |
| 5           | 165                                        | — 28                                 | 137                  |                | 150  | PS, I                     | 10-4-46                 | 70         |                              |                                 |                            |               |              |                            |                |                                                                                                      |
| 6           |                                            | — 33                                 |                      |                | 18   | PS                        | 10-4-46                 | 69         |                              |                                 |                            |               |              |                            |                |                                                                                                      |
| 7           |                                            | — 40                                 |                      |                | 18   | PS                        | 10-4-46                 | 69         |                              | 168                             | 9                          | 4             | .0           | .4                         | 117            | .79 ppm iron (in ppt.)<br>.62 ppm iron (in ppt.)<br>.78 ppm iron (in ppt.)<br>.36 ppm iron (in ppt.) |
| 8           |                                            | —100                                 |                      |                | 8    | D, S                      | 10-4-46                 | 67         |                              | 79                              | 6                          | 4             | .1           | .1                         | 57             |                                                                                                      |
| 9           | 150                                        | — 10                                 | 140                  |                | 8    | PS                        | 10-4-46                 | 69         |                              | 109                             | 2                          | 8             | .0           | .0                         | 12             |                                                                                                      |
| 10          |                                            | — 15                                 |                      |                | 8    | PS                        | 10-4-46                 | 70         |                              | 5                               | 2                          | 4             | .0           | .8                         | 6              |                                                                                                      |
| 11          |                                            | — 9.2                                |                      |                | 8    | PS                        | 10-4-46                 | 70         |                              | 11                              | 4                          | 3             | .0           | 4.6                        | 15             |                                                                                                      |
| 12          |                                            | — 76                                 |                      |                |      |                           |                         |            |                              |                                 |                            |               |              |                            |                |                                                                                                      |
| 13          |                                            |                                      |                      |                |      |                           |                         |            |                              |                                 |                            |               |              |                            |                |                                                                                                      |

<sup>1</sup>Abbreviations: PS, public supply; D, domestic; I, industrial; S, stock.



TABLE 20  
Well Data and Analyses of Water from Wells in the Tertiary Area of Alabama  
(Well numbers in table correspond with those in Plate 1)

## WILCOX COUNTY

| Well Number | Location           | Owner or name    | Driller                | Type of well | Depth of well (feet) | Diameter of casing (in.) | Depth of casing (ft.) | Principal <sup>2</sup> water-bearing formation | Remarks                                                                |
|-------------|--------------------|------------------|------------------------|--------------|----------------------|--------------------------|-----------------------|------------------------------------------------|------------------------------------------------------------------------|
| 1           | Catherine          | Ralph Martin     | J. A. Brady            | J            | 1,320                | 3                        | 1,320                 | Eutaw fm.                                      | Drilled in 1917.                                                       |
| 2           | Catherine          | Goodwin Pharr    | C. F. Kirker           | J            | 1,369                | 6-4                      | 1,300                 | Eutaw fm.                                      | Drilled in 1926. Used at cannery.                                      |
| 3           | Catherine          | O. G. McBeath    | Merry Bros.            | D            | 1,212                | 5-3                      | 1,212                 | Eutaw fm.                                      | Drilled in 1946.                                                       |
| 4           | Pine Hill          | P. Vaughn 2      | J. R. Bridges          | D            | 270                  | 6                        | 22                    | Nanafalia fm.                                  | Drilled in 1945. Supplies town.                                        |
| 5           | Pine Hill          | P. Vaughn 1      | Rachell                | J            | 190                  | 4                        | 40                    | Tuscahoma (?) sand                             | Drilled in 1925. Supplies town.                                        |
| 6           | Kimbrough          | S. F. Burge      | Chaney Co.             | D            | 210                  | 4                        | 40                    | Naheola fm.                                    | Drilled in 1930. Wells in vicinity range from 200 to 300 ft. in depth. |
| 7           | 2 mi. W of Camden  | Convict Camp     | Layne-Central          | D            | 435                  | 6                        | 435                   | Ripley fm.                                     | Drilled in July 1934.                                                  |
| 8           | Camden             | Lidell Power Co. | Geo. Moulton           | J            | 400                  | 6                        | 395                   | Ripley fm.                                     | Drilled in 1915.                                                       |
| 9           | Camden             | Lidell Power Co. | Gray Artesian          | D            | 401                  | 6                        | 311                   | Ripley fm.                                     | Drilled in 1924.                                                       |
| 10          | Camden             | Lidell Power Co. | Alfred Johanson        | D            | 1,235                | 4½                       | 195                   | Eutaw fm.                                      | Drilled in August 1907.                                                |
| 11          | Arlington          | R. E. Lambert    | W. J. Bozeman          | D            | 344                  | 6                        | 268                   | Ripley fm.                                     | Drilled in 1946. 40 ft. of 6-in. screen.                               |
| 12          | 1¾ mi. E of Furman | Claud Williams   | Merry Bros.            | D            | 354                  | 6                        | 80                    | Ripley fm.                                     | Drilled in 1946.                                                       |
| 13          | Pineapple          | Town Well 1      | Virginia Machinery Co. | D            | 628                  | 8-6                      | 607                   | Ripley fm.                                     | Drilled in March 1938. Screen 607 to 628 ft.                           |
| 14          | Alberta            | B. Daugett       | J. R. Bridges          | D            | 1,036                | 4                        | 21                    | Eutaw fm.                                      | Drilled in 1946.                                                       |

<sup>1</sup>Abbreviations: D, drilled; J, jetted.

<sup>2</sup>Abbreviations: fm, formation.



TABLE 20—Continued

Analyses by G. A. Billingsley, V. T. McNamara, N. K. McShane, D. M. Parrish, and W. T. Platt  
Parts per million

WILCOX COUNTY

| Well data   |                                      |                      |                | Chemical analyses |              |                    |            |                              |                                 |                            |               |              |                            |                | Remarks               |
|-------------|--------------------------------------|----------------------|----------------|-------------------|--------------|--------------------|------------|------------------------------|---------------------------------|----------------------------|---------------|--------------|----------------------------|----------------|-----------------------|
| Well number | Water level                          |                      | Yield (g.p.m.) |                   | Use of water | Date of collection | Temp. ° F. | Carbonate (CO <sub>3</sub> ) | Bicarbonate (HCO <sub>3</sub> ) | Sulfate (SO <sub>4</sub> ) | Chloride (Cl) | Fluoride (F) | Nitrate (NO <sub>3</sub> ) | Total hardness |                       |
|             | Above + or below—land surface (feet) | Above mean sea level | Flow           | Pump              |              |                    |            |                              |                                 |                            |               |              |                            |                |                       |
| 1           | 207                                  | — 60                 |                | 7                 | D-S          | 2-28-46            | 69         | 16                           | 424                             | 3                          | 258           | 3.0          | 2.0                        | 20             | Slight salty taste.   |
| 2           | 185                                  | — 59                 |                | 150               | I            |                    |            |                              |                                 |                            |               |              |                            | 24             |                       |
| 3           | 202                                  | — 55                 |                | 15                | D-S          | 3- 4-46            | 71         |                              | 471                             | 2                          | 224           | 2.8          | .3                         | 78             |                       |
| 4           | 123                                  |                      |                | 15 ±              | PS           | 3-24-47            | 66         |                              | 260                             | 35                         | 110           | 0.2          | 0.2                        | 26             |                       |
| 5           | 124                                  |                      |                | 5                 | PS           | 8-18-45            | 73         |                              | 252                             | 7                          | 42            | 0.1          | 1.0                        | 78             | Pumping level 213 ft. |
| 6           | 81                                   | — 5                  | 76             |                   | D            | 2-27-47            | 64         |                              | 170                             | 14                         | 14            | 0.2          | 1.8                        |                |                       |
| 7           |                                      |                      |                | 66                | PS           |                    |            |                              |                                 |                            |               |              |                            |                |                       |
| 8           | 165                                  | — 40                 | 115            | 40                | PS           |                    |            |                              |                                 |                            |               |              |                            |                |                       |
| 9           | 158                                  | — 60                 | 98             | 45                | PS           | 8-18-45            | 73         | 14                           | 333                             | 42                         | 57            | 1.2          | 0.4                        | 10             |                       |
| 10          | 153                                  |                      |                |                   | PS           |                    |            |                              |                                 |                            |               |              |                            |                |                       |
| 11          |                                      | — 44                 |                | 100               | D-S          |                    |            |                              |                                 |                            |               |              |                            |                |                       |
| 12          | 269                                  |                      |                | 15                | D-S          |                    |            |                              |                                 |                            |               |              |                            |                |                       |
| 13          | 355                                  | —139                 | 216            | 50                | PS           | 8-18-45            | 73         | 18                           | 363                             | 80                         | 99            | 2.4          | 0.4                        | 14             |                       |
| 14          | 156                                  | — 18                 | 138            | 3                 | D            | 3-15-46            |            |                              |                                 |                            |               |              |                            |                |                       |

<sup>1</sup>Abbreviations: PS, public supply; D, domestic; S, stock; I, industrial.







